FOURTEENTH ANNUAL MEETING

TRANSACTIONS OF THE

Western Surgical and Gynecological Association

Fourteenth Annual Meeting, held at Milwaukee, Wis., December 28 and 29, 1904 : : : : :

CHICAGO:
PRESS OF AMERICAN MEDICAL ASSOCIATION
ONE HUNDRED AND THREE DEARBORN AVENUE
1905.

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OFFICERS FOR 1905.

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19690

EX-PRESIDENTS AND MEETING PLACES.

PRESIDENT.	PLACE.	YEAR.
S. S. Todd	Topeka	1891
Milo B. Ward (deceased)	Kansas City	1892
Milo B. Ward (deceased)	Des Moines	1893
Lewis Schooler	Omaha	1894
J. E. Summers, Jr.	Kansas City	1895
T. J. Beattie	Topeka	1896
Jos. Eastman (deceased)	Denver	1897
D. S. Fairchild	Omaha	1898
H. C. Crowell	Des Moines	1899
O. Beverly Campbell	Minneapolis	1900
A. F. Jonas	Chicago	1901
Jas. E. Moore	St. Joseph, Mo	1902
Alex. Hugh Ferguson	Denver	1903
Charles H. Mayo	Rochester, Minn.	1904

The Western Surgical and Gynecological Association does not hold itself responsible for, or necessarily endorse, any of the papers printed herein.

B. B. Davis,
Secretary-Treasurer.

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EXECUTIVE SESSION

DECEMBER 28.—FIRST DAY—MORNING SESSION.

The Association met in the Colonial Hall of the Plankinton Hotel, and, in the temporary absence of the Chairman of the Committee of Arrangements, Dr. H. A. Sifton, the Association was called to order by Dr. Sayle, of Milwaukee, who introduced the President of the Association, Dr. Charles H. Mayo, of Rochester, Minnesota.

On motion of the Secretary, visiting surgeons who were not members of the Association were invited to participate in the discussion.

Dr. A. L. Wright, of Carroll, Iowa, then read a paper on "Kidney Stone," which was discussed by Drs. Ferguson, Haines, and, in closing, by the essayist.

Dr. M. L. Harris, of Chicago, followed with a paper entitled "Newer Methods of Diagnosis in Diseases of the Urinary Tract."

This paper was discussed by Dr. Davis and, in closing, by the essayist.

Dr. Alexander Hugh Ferguson, of Chicago, read a paper on "The Methods of Exploring the Abdomen, and a New One," which was accompanied by numerous photographs.

Discussed by Drs. Coffey, Wright, Thienhaus, and in closing by the essayist.

Dr. Arthur E. Hertzler, of Kansas City, Mo., contributed a paper on "Peritoneal Adhesions: Their Cause and Prevention."

Dr. E. M. Sutton, of Peoria, Ill., read a paper entitled "Operation for Retained Testicle." He also re-

ported a "Case of Aneurysm of the Superior Mesenteric Artery," upon which he had operated.

The paper was discussed by Dr. Harris, and the discussion closed by the essayist.

Dr. J. F. Percy, of Galesburg, Ill., read a paper entitled "The Practical Significance of Certain Common Symptoms in the Upper Abdomen," which was discussed by Drs. Murphy, Ferguson, Haggard, and Davis.

Dr. Palmer Findley, of Chicago, reported a "Case of Splenic Anemia, with Splenectomy."

Discussed by Dr. Coffey.

On motion, the Association adjourned until 1:30 p. m.

First Day—Afternoon Session.

The Association reassembled at 2 p. m., and was called to order by the President.

Dr. E. M. Sala, of Rock Island, Ill., read a paper on "High Frequency Electricity as a Factor in the Treatment of Surgical and Gynecological Diseases."

Dr. John B. Murphy, of Chicago, read a paper on "The Care of the Axilla after Excavations for Malignant or Infective Lesions."

Discussed by Drs. Mayo, Andrews, Halstead, Ferguson, Davis, Sifton, Harris and in closing by the essayist.

Dr. James E. Moore, of Minneapolis, Minn., read a paper on "Moorhof's Bone Plug," which was discussed by Dr. Mann, and in closing by the essayist.

Dr. A. E. Halstead, of Chicago, read a paper entitled "Extirpation of the Gasserian Ganglion in the Treatment of Facial Neuralgia," which was discussed by Drs. Murphy and Mayo, and the discussion closed by the essayist.

Dr. D. C. Brockman, of Ottumwa, Iowa, read a paper on "Surgical Diseases of the Pancreas."

Dr. D. W. Basham, of Wichita, Kansas, followed with a paper entitled "Cysts of the Pancreas."

These two papers were discussed jointly by Drs.

Haggard, Coffey, and the discussion closed by Dr. Brockman.

Dr. B. Merrill Ricketts, of Cincinnati, Ohio, contributed a paper on "Excision of the Elbow Joint for Traumatic and Arthritic Ankylosis."

This paper was accompanied by numerous skiagraphs, and was discussed by Drs. Ferguson, Andrews, Moore, and in closing by Dr. Ricketts.

Dr. A. E. Benjamin, of Minneapolis, Minn., read a paper on "The Operative Treatment of Fractures and Sprains," which was discussed by Drs. Haines and Ferguson, and in closing by the essayist.

Dr. A. M. Pond, of Webster City, Iowa, read a paper on "Surgical Considerations of Gastric Dilatation," which was discussed by Drs. Oviatt, Abbott, Brockman. Davis, Ries, and in closing by the essayist.

On motion, the Association adjourned until 9 a. m. Thursday.

At the banquet, President Mayo delivered his address. He selected for his subject, "Mortality, Disability and Permanency of Cure in Surgery."

Hon. Edward M. Hyzer, of Milwaukee, delivered the following address:

THE SURGEON AND THE LAWYER.

Mr. Toastmaster:—It is with some natural hesitation and even embarrassment that I speak *of* lawyers *to* surgeons, and more so because the sentiment to which I am responding suggests some degree of comparison. I shall not make any comparison in the ordinary sense, because, although somewhat accustomed to the attitude of defense, I could not hope for a full measure of success in bringing my profession well out of a conflict with such an array as this.

Further, this sentiment may be thought to suggest some professional companionship between the lawyer and the surgeon, and that such companionship might be discussed with interest and profit, but I know of no place where these two professions touch unless it be in

the courts, when the expert lawyer grapples with the expert surgical witness, and I pass that point of contact with the hope that silence, like charity, may cover a multitude of sins.

There are, however, interesting resemblances and differences in these two professions. The resemblances are those common to intellectual employment and mental activity. The differences are greater, and more peculiar, and more interesting. They grow out of dissimilar modes of thought, and dissimilar starting points; dissimilar means and dissimilar ends.

Both professions are engaged with the welfare of the human biped; the one with his social relations, the other with his physical relations; the one with making his life endurable, the other with making his life possible.

Now, while so engaged, why must the legal profession be always, I say it sadly, intellectually in the rear?

I am bandying no compliments, assuming no false attitude of humility, when I put this question in the form of an admission against my own profession. The question rightly assumes the fact.

The legal profession is scientifically *behind* the surgical profession. It may entertain society and itself with more mental gymnastics, more intellectual pyrotechnics; the molecules of its gray matter may even more easily and readily assume the relation which results in what is called cerebration; but its accumulation of information, its real scientific assets, are distinctly less in quantity and quality than those which confessedly belong to the other profession. Why is this? The answer is but a re-statement of the axiom that to retain real intellectual life; to be able to search for knowledge; to dig into the foundations of the earth for it; to ask the stars for it; to grind rocks to their atoms for it; to tear life to pieces, to its very amoeban protoplasm, for it; *to follow Truth* to her hiding places; to find her and hold her. all this now, as of old, needs a mind un-

trammeled, a brain unshackled; needs intellectual freedom. Your profession has that, and mine has it not.

I do not here refer to the ordinary difficulties and entanglements of social environment. Your profession suffers among those equally with mine. I refer to the fact that *truth* in the law is and always must be what some enthroned, empowered, enbenched somebody *says it is,* instead of truth, pure and simple and undefiled and undefilable, as your profession knows it.

Right there my profession stumbles and falls, not from any mental or moral obliquity, but because it can go no farther.

There stands its eternal confrontment, its impassable barrier—*truth is what somebody says it is.* There is no appeal, no re-examination, no further inquiry, no scalpel, no microscope, no postmortem.

The lawyer can not deny judicial affirmations. He may have disbelieved with his whole soul, but he must admit the judicial affirmation and believe it; yea, he must assert it and use it as his own.

Let me illustrate. One of the multitude takes on, by contagion or otherwise, the microbe of litigation, and finds himself in court charged with one of the forms of legal disease. The court listens to the evidence and solemnly decides that the man has the disease, and *judicially* thereafter the man has it, whether he has it or not. Now that decision stands. It is called *res adjudicata.* The man may get well and be able to prove to everybody that he has recovered, but legally he is still sick of this same disease. He may be able some time to show conclusively that he never had the disease, but legally he had it, and still has it, and always will have it. It may develop that everybody was mistaken and that the man had legal angina pectoris, instead of legal cardiac thrombosis as charged—it is no use; he has and always will have cardiac thrombosis, whether he has it or not.

Not only this, but his own lawyer, if he be a believer

in his profession and its courts, as he ought to be, must admit that his client had the disease, although he knows perfectly well that he never had it.

Not only this, but that decision becomes a legal rule for the determination of cases where other men are charged with having the same disease, and they are brought within it and are adjudged to have the same disease, not at all because anybody believes them to have it, but because the first man was *declared* to have it, notwithstanding it was long ago discovered that he never had it at all; and in the end they are all accordingly adjudged to have it, and the whole profession is in duty bound to admit the fact, and that it is and always will be a fact, when it never was and never could be the fact at all.

Something like a century ago some English judge decided that the test of sanity or insanity, and, therefore, responsibility or non-responsibility for crime, was the appreciation of right and wrong.

In other words, the judge declared that if the man on trial before him knew that his act was wrong, he was sane. For fifty years thereafter whenever the sanity of an alleged criminal was made an issue in a court that issue was determined by the test established by that first decision. For fifty years your profession told mine that the test rested upon an unfounded assumption, and was unscientific and untrue. For fifty years you told us that, and we refused to listen. We heard you at last and finally changed our test and made it conform to science. Most of our profession knew all the time that the established test was not in accord with science. But we went on judging people to be sane or insane according to the test established by the English judge, and without inquiring at all into the actual fact, and for years men were adjudged to be sane, not because they were believed to be sane, but because the first man was adjudged to be sane.

You observe that it was impossible for the first man ever to recover. He must always remain sick. It was equally impossible for anybody to show by any amount of proof that he never was sick. Not only this, but all the other men were held to be sick of the same disease, because the first man was, not in fact sick, but *held to be sick.*

In a perhaps unfair way this shows that the legal profession is engaged, not in searching for truth, but in searching for what somebody has said about it.

Here are the trammels on the legal mind, the shackles on the legal brain. Here is the intellectual slavery which leads us in a path so different from yours.

This stability of decision, this establishment of rules for social government and social protection without reference to absolute truth is beyond question necessary in human affairs, but it does not lead the legal profession toward the goal of absolute truth.

Your profession can search for the truth and find it and act upon it. Mine can not. Mine must act to-day and its action must be according to established rules, and its action must establish more rules for future action. Otherwise all would be social chaos.

Of course, you, too, act every day upon insufficient information, but insufficient information does not become to you a rule. Your patient may recover, and you admit it; or, if he does not recover, his death may lead you to cure the next, instead of intentionally killing him just because you accidentally killed the first one. Your scalpel *tells you something.* The particular patient may have lost interest in the question, but your profession has not, and it goes on in this never-ending search for the truth. The truth you search for is absolute. The truth we search for is relative. You are unshackled. We are bound, hand and foot. Your pathway leads towards the glory of the summit. Ours lies always in the valley. Your trust is the greater,

and rightly so, because it has to do with life from its fountains to its oceans.

DECEMBER 29—SECOND DAY—MORNING SESSION.

The Association met at 9:30 a. m., and was called to order by the President.

Dr. Van Buren Knott, of Sioux City, Iowa, read a paper on "The Treatment of Acute Perforations of the Upper Abdominal Viscera," which was discussed by Drs. Ruth, Crowell, Sala, Hertzler, Fairchild, Benjamin, Jackson, Ground, and the discussion closed by Dr. Knott.

Dr. L. L. McArthur, of Chicago, read a paper entitled "Report of a Rare Case of Pneumatocele," which was discussed by Dr. E. Wyllys Andrews.

Dr. H. A. Sifton, of Milwaukee, Wis., read a paper on "Skiagraphy in the Treatment of Fractures," and showed numerous skiagraphs.

Discussed by Drs. McArthur, Andrews, Ruth, Boufleur, Harris, Benjamin, and in closing by Dr. Sifton.

Dr. Arthur T. Mann, of Minneapolis, Minn., read a paper on "The Manufacture of Tin Splints," which was discussed by Drs. Moore, Lord, and the discussion closed by Dr. Mann.

Dr. H. C. Crowell, of Kansas City, Mo., read a paper entitled "Syncytioma Malignum," which was discussed by Drs. MacLaren, Hertzler, and in closing by Dr. Crowell.

Dr. Daniel N. Eisendrath, of Chicago, read a paper on "Fractures of the Tarsal Bones," which was discussed by Drs. Knott, Percy, Fairchild, Thienhaus, and the discussion closed by Dr. Eisendrath.

Dr. R. C. Coffey, of Portland, Oregon, contributed a paper on "Ptosis of the Abdominal and Pelvic Organs," which was accompanied by numerous drawings.

Discussed by Drs. Moore, Hertzler, Davis, Ruth, Eisendrath, and in closing by Dr. Coffey.

On motion, the Association adjourned until 1:30 p. m.

SECOND DAY—AFTERNOON SESSION.

The Association reassembled at 2:30 p. m., and was called to order by the President.

Dr. Archibald MacLaren, of St. Paul, Minn., read a paper on "Appendicitis in Women," which was discussed by Drs. Ferguson, Davis, Moore, Barrett, Andrews, and the discussion closed by Dr. MacLaren.

Dr. D. S. Fairchild, of Des Moines, Iowa, read a paper on "Hospital Organization and Management in Smaller Cities," which was discussed by Drs. Coffey, Ferguson and Eisendrath.

Dr. Alexander Hugh Ferguson, Chairman of the Executive Council, presented the following report:

REPORT OF THE EXECUTIVE COUNCIL.

There were present Drs. Mayo, Ferguson, Moore, Knott, Oviatt, and Davis.

SECRETARY-TREASURER'S REPORT.

RECEIPTS.

Balance on hand, Dec. 23, 1903	$740.07	
Fees and dues, as per cash book	665.10	
For illustrations in transactions	9.35	
		$1,414.52

DISBURSEMENTS.

Leonard Freeman, Chr. Com. of Arrangements	$75.00
Fee returned (S. E. O.)	10.00
Fee returned (S. E. O.)	10.00
Express, personal and miscellaneous expense, Denver meeting	25.00
Geo. H. Simmons, Honorarium	100.00
Printing transactions and express on same	358.35
Freight, express, printing, postage, etc	72.21
	786.36
Dec. 23, 1904, balance on hand	628.16
	$1,414.52

As the limitation of membership has been almost reached, it was decided that eleven names be recommended for membership. The following are recommended:

W. D. Haggard.....Nashville, Tenn.
Harry M. Sherman.....San Francisco, Cal.

Robt. C. Coffey.....Portland, Oregon.
F. E. Wallbridge.....Milwaukee, Wis.
Wm. Mackie.....Milwaukee, Wis.
Gustav A. Kletzsch.....Milwaukee, Wis.
Roland Hill.....St. Louis, Mo.
Andrew C. Smith.....Portland, Oregon.
W. D. Haines.....Cincinnati, Ohio.
Jabez N. Jackson.....Kansas City, Mo.
Dudley Tait.....San Francisco, Cal.

It is recommended that the other eleven applicants be put on the waiting list.

The following names are recommended as officers for the ensuing year: President, H. D. Niles, Salt Lake City, Utah; First Vice-President, E. Wyllys Andrews, Chicago; Second Vice-President, W. W. Grant, Denver, Colo.; Secretary-Treasurer, B. B. Davis, Omaha, Neb.; Members of Executive Council: C. W. Oviatt, Oshkosh, and C. H. Wallace, St. Joseph; Chairman of Committee of Arrangements, H. C. Crowell, Kansas City, Mo.; place of next meeting, Kansas City, Mo.

It is also recommended that hereafter no member be elected to office at any meeting who is not present at that session of the Association.

Dr. Brockman moved that the report of the Council be accepted, and that the Secretary be instructed to cast an affirmative ballot of the Association for the names of officers mentioned, which was seconded and unanimously carried.

The Secretary then cast the ballot of the Association, and the officers mentioned were declared duly elected.

The Secretary asked whether it met with the approval of the members of the Association to have authors furnish short abstracts of their papers to be published in the official program. The object of this was that the members could look over these abstracts and

get a general idea of the line of argument which would be pursued by each author.

On motion of Dr. Lord, the method of the Secretary in printing abstracts of papers in the official program was endorsed.

Dr. E. Wyllys Andrews, of Chicago, then read a paper entitled "A New Method of Arthrotomy for Old Dislocations of the Shoulder Joint," which was discussed by Drs. Ferguson, Ruth, MacRae, and in closing by the essayist.

Dr. C. E. Ruth, of Keokuk, Iowa, read a paper entitled "Curettage and Puerperal Sepsis," which was discussed by Dr. MacLaren.

Dr. Donald MacRae, of Council Bluffs, Iowa, read a paper entitled "Our Duty to the United States Army and its Medical Corps," which was discussed by Drs. Davis, Knott, Fairchild, Ruth, and the discussion closed by the essayist.

At the conclusion of the discussion, Dr. MacRae presented the following preambles and resolutions:

Milwaukee, Dec. 29, 1904.

WHEREAS, The proposed Field Service Regulations, U. S. Army, provide for field hospital accommodations of but 216 beds, with a personnel of but 8 medical officers, 16 non-commissioned officers, and 82 privates for a division numbering approximately 20,000 men;

WHEREAS, The experience of the best organized armies of the world shows that this allowance is much below the actual requirements,

Germany having 1,200 beds, with 54 officers and 282 men per division.
France having 400 beds, with 44 officers and 560 men per division.
Great Britain having 300 beds, with 15 officers and 201 men per division.
Russia having 840 beds, with 36 officers and 428 men per division.
Japan having 1,200 beds, with 48 officers and 648 men per division;

and,

WHEREAS, The said proposed Field Service Regulations, U. S. Army, provide for a Divisional Ambulance establishment, the personnel of which numbers but six officers, 16 non-commissioned officers, and 122 men; while that of

Germany numbers 14 officers, 16 non-commissioned officers and 230 men.

France numbers 14 officers, 25 non-commissioned officers, and 191 men.
Great Britain numbers 8 officers, 32 non-commissioned officers, and 170 men.
Japan numbers 13 officers, 61 non-commissioned officers, and 342 men.
Russia numbers 6 officers, and 285 men.
therefore, be it

Resolved, First, That the Western Surgical and Gynecological Association, assembled in Milwaukee, December 29, 1904, respectfully represent to the President of the United States, through the Secretary of War, the facts as above set forth;

Resolved, Second, That the President is respectfully petitioned to direct that the military authorities provide a Field Medical Organization for our Army at least equal in all respects to the best that exists in any Army, and which will meet the approval of military sanitarians generally, to the end that our sick and wounded in future wars may receive adequate care and attention;

Resolved, Third, That immediate action be taken to bring this matter before the President, so that a proper medical organization can be prescribed in the aforesaid Field Regulations, which are now about to be issued, and which it is the hope of this Association he will not permit to be published until said proper Medical Organization is provided for.

Presented by Donald MacRae, Jr., Council Bluffs, Iowa, Late Lieut. and Surg., 51st Iowa Inf., Major and Surg., I. N. G.

On motion of Dr. Knott, the resolutions were unanimously adopted, and the Secretary instructed to forward a copy of them to President Roosevelt as soon as possible.

Dr. G. G. Eitel, of Minneapolis, Minn., read a paper entitled "Removal of the Covering of the Ovaries in Ovarian Dysmenorrhea."

Dr. Wm. E. Ground, of Superior, Wis., followed with a paper on "Diagnosis of Early Tubal Pregnancy," which was discussed by Drs. Lord, Haines, and in closing by the essayist.

On motion, the following papers were read by title, and referred to the Publication Committee:

"A Consideration of the Present Methods for the Correction of Retrodisplacements of the Uterus," by Dr. C. H. Wallace, of St. Joseph, Mo.

"A New Self-Retaining Catheter and Vesical Irrigator," by Dr. H. G. Wetherill, of Denver, Colo.

"Compound Traumatic Separation of the Lower Epiphysis of the Femur," by G. G. Cottam, M.D., Rock Rapids, Iowa.

There being no further business to come before the meeting, on motion, the Association then adjourned, to meet in Kansas City, Mo., December, 1905.

B. B. DAVIS, Secretary.

PRESIDENT'S ADDRESS

MORTALITY, DISABILITY AND PERMANENCY OF CURE IN SURGERY.

CHARLES H. MAYO, A.M., M.D.
Surgeon to St. Mary's Hospital.
ROCHESTER, MINN.

A very ordinary surgeon, by means of selection of cases, aseptic care and the kindness of nature, may have a low death rate and yet benefit his patients but little. The question of mortality is one of the most important in surgery, and yet there is no rule concerning its method of computation. A study of mortality should be based on some definite plan to render reports and statistics of value to others than those who make them.

Hospital reports seldom present to the reader more than a general estimate of the amount of work done by the individual operator and may, to some extent, add to the respect paid to his opinion by those able to judge. However computed, the mortality rate serves its purpose, as far as the surgeon is concerned, in giving an approximate rate which is liable to a certain amount of fluctuation, due frequently to uncontrollable circumstances. We once performed a consecutive series of 179 abdominal operations of all kinds without a death; then the one hundred and fifty-sixth patient operated on died, yet such a statement, unqualified, would be of no value to other surgeons, as there were 5 deaths in the next 20 cases.

Some operators claim that if the patient dies from the operation it should be counted, but if he survives the operation for a time, although it fails to give relief, and he dies from the disease or complications, it should not be charged to the surgical work. This method allows of a large latitude for the surgeon unconsciously to favor or to discredit some particular operation, according to his prejudice. A well-known surgeon believes that if an individual dies within fourteen days after an operation from any cause, the death should be attributed to the operation, but after that time it is a question to be settled by the judgment of the operator.

In our work we have taken the view of the layman, that if the patient goes into the hospital alive and comes out dead, the death resulted from, or in spite of, the operation, charging as a death from operation every patient who dies in the institution without regard to cause of death or the time elapsing between the operation and the fatal issue, some patients dying as long as three months after from disease or accidental cause, such as apoplexia, pneumonia, nephritis, heart disease, pulmonary embolism, etc.

The greatest reduction in mortality has come through aseptic and antiseptic methods, which have been reduced to such simple principles that they are within the reach of all. This has been the means of developing skilled surgeons, who still further reduced the death rate by an intelligent selection of cases, reduction of operative shock and careful postoperative care. There is unquestionably a proper time for surgical intervention, and the failure to grasp the opportunity at the favorable moment is the cause of the greater part of the mortality, besides increasing the period of disability and reducing the number of cures. With the growing intelligence of the profession there is much less delay, owing to their advice, than formerly; in fact, there are at present few physicians watching tumors of the breast to see if they are malignant before advising removal. This is also

true of cancer in other regions, and to-day cancer is classed among curable diseases when operated on early, while still local, and without metastasis. We might also say that only cancers of the stomach are still retained in the medical wards until starvation, stasis and the failure of nutrient enemata demand surgical intervention at the most unfavorable moment.

The surgeon has not been blameless in inducing the public to delay operation, not directly, but indirectly, by operating on the hopeless cases of cancer in which the inoperable condition could be proved, and in which incomplete operation is followed by more rapid growth. The continued disability and inevitable death become necessarily associated in the minds of laymen with the operation, deterring others from seeking early surgical relief and inducing them to look for some religious, irregular medical or quack method of cure.

STATISTICS.

In appendicitis the contrast between the mortality in cases operated on at a favorable period and the reverse (including the operations of necessity), has taught even the layman not to trust too much or too often to the kindness of nature. The mortality, therefore, has been reduced to a very low point. During the past year there were operated on in St. Mary's Hospital 516 cases of appendicitis; of these there were 147 acute cases, with 4 deaths; this includes a number of patients having diffuse peritonitis requiring general abdominal drainage. There were 362 chronic or interval operations and 10 tuberculous cases, with no deaths. This does not include 244 appendectomies made incidental to other abdominal operations, as where more than one procedure is accomplished through a single incision only the major is counted. Five years ago such results could not have been obtained, as we did not have the co-operation of the public. In the stomach operations during this year there were 106 gastroenterostomies, with 8 deaths, 7½

per cent., most of these deaths being due to advanced cancer, while in 13 pylorectomies and partial gastrectomies there were no deaths, owing to the early stage in which the disease was attacked. Abdominal hysterectomies gave a death rate of 5 per cent. in 101 cases, an increase of 2 per cent. over former years, due to a greater effort to eradicate malignant disease, immediate results being subordinated to permanent. In no class of work did the low mortality of early operation contrast more favorably with the unavoidable death rate, due to delayed surgery, than in gallstone disease. In a recent review of the mortality of 1,000 operations up to Dec. 1, 1904, for gallstone disease by W. J. Mayo and myself, we showed an average death rate of 5 per cent. in the hospital, 960 for benign disease with a mortality of 4.2 per cent. The total list does not include 101 cholecystostomies and 44 cholecystectomies in connection with common-duct operations. There were 673 cases of cholecystostomies with a mortality of 2.4 per cent. This group includes most of the acute infections. Cholecystectomy was done 186 times with a mortality of 4.3 per cent. This operation was employed for special indications, such as cystic-duct operation, thick-walled gall bladders, suspicion of malignancy and cholecystitis without stones. There were 137 operations for stone in the common duct with a mortality of 11 per cent., 7 per cent. from operation and 4 per cent. from secondary complications after more than three weeks. Those patients operated on during the quiescent period with little jaundice and slight infection all recovered, 4 patients with extreme icterus and with subcutaneous hemorrhages all died, 4 patients with complete obstruction of the common and hepatic ducts which were filled with clear fluid and no bile all died. There were 40 cases of malignant disease with a mortality of 22.5 per cent. In contrasting these mortalities we must constantly remind ourselves that in simple uncomplicated gallstone disease the death rate in 416 cases was less than .5 per

cent., and that practically all the complicated cases were at one time in this stage when a safe operation could have been done. Of the cases of malignant disease practically all showed that gallstones had played the part of a chronic irritant.

Operations in the upper abdomen involving the stomach, liver and pancreas, involve a higher mortality than those of the lower abdomen, as it is near the danger zone of active absorption and adhesions are more permanent from lessened peristalsis.

The cases of shock we have seen following operations have been due to loss of blood, to handling the small bowel, and to traction on abdominal viscera and large nerves.

Laboratory substitutes for blood were rarely employed, as, while temporary improvement was noted, the operation necessary involved its own risks and disadvantages. The almost unknown chemistry of the living cell secures the best preparation of solutions to fit them to mix with the blood, and to cause the least harm, therefore, when deemed necessary, as in starvation and shock, we use the subcutaneous infusion or the slow rectal salt enema, without pressure, after the method of J. B. Murphy.

DISABILITY.

For his own convenience, or to save himself a few minutes' time, a surgeon has no right to add to the temporary disability of a patient by making an unnecessarily long incision. An extensive incision must be justified by its increased primary safety or by increased certainty of cure. Practically speaking, each inch of abdominal incision calls for about three or four extra days in bed. The question of detention from business is now receiving considerable attention in this country, so that it creates a most unfavorable impression when through accident or unpreventable causes a patient must be retained unusually long in the hospital. In St. Mary's

Hospital we have materially reduced the time of detention of patients, as compared with the same operations in the developing days of surgery. Considering similar operations of only six or eight years ago, we have during this year so reduced this time that it represents a gain equal to the board, care, nursing and disability of one person for approximately over thirty years. For instance, in hernias, (of which there were 206 during 1904) in the early days these patients were in bed four weeks, and even six years ago, three weeks. This is now reduced to thirteen days in favorable cases. Stomach and gall-bladder cases are confined to bed from twelve to fourteen days; formerly this time was from eighteen to twenty-five days. In 169 stomach operations with recovery this year a saving was made of about 200 weeks. To almost the same extent, a saving of time has been obtained in all classes of operation. During the year in appendicitis work it was most marked; formerly these operations in non-drainage cases detained patients three weeks; now the patients are up in eight days and home in ten, a saving in all of about fourteen years. In considering the subject we must not be intimidated by those who retain their cases an excessive length of time, nor be rendered reckless by those who, at the other extreme, urge the mobility of abdominal cases the next day after operation.

The operative incision rarely should be employed for the drainage of abdominal sepsis. One or more separate punctures ought to be made for this purpose at the most favorable situation and the original incision closed, thereby avoiding hernia liability and shortening convalescence.

In our practice every effort is made to secure dry wounds. Temporary drainage is employed in incisions through fat structures where the lymph absorbents are often unequal to the task of acute drainage. Other operations which do not remove lymph nodes are not

drained unless infected. All operations in which glands are removed are drained. Irrigation is not employed in septic cavities for the removal of fluids derived from the tissues of the body, such as empyema. Irrigation is at times employed for the removal of foreign materials, such as escape from perforation of the stomach or intestine. Severe peritoneal sepsis, such as occurs from a ruptured appendix, if diffuse, is treated by the exaggerated Fowler position (sitting posture) with large drains in the pelvis. The results are remarkably good in this class of cases which was formerly so fatal.

PERMANENCY OF CURE.

The bugbear of surgery is malignancy; the bulk of mortality, recurrence and disfigurement is from cancer. A poor surgeon, as far as operative skill or dexterity is concerned, may be a great surgeon from the standpoint of radical cure. The only way that regular medicine can defeat methods and schools of quackery is to study them and to prove by results that there are better methods. Efforts at legislation merely advertise such irregular methods, too often to our disadvantage, by placing those who practice them in the light of being persecuted. The principal progress made in the study of cancer has been recognition of its mode of extension and of the cause of death. Until this was manifest in many instances we could claim but little over the man with the cancer paste except shortened convalescence.

Investigation into that much-neglected portion of anatomy, the lymphatic system, has finally placed the surgery of cancer on a scientific footing. Possibly little reduction has been made in primary mortality, but a great improvement in permanent results has been effected.

In considering the general subject of cancer, it has been our experience that age, as a rule, makes a great difference in the rapidity of the progress of the disease as well as in the prospect of cure; cancer in the young being early disseminated by the activity of the lymph system,

while in the old, with atrophic lymphatics, the disease may remain a long time essentially inactive and local. Other conditions being the same, each additional decade of life gives improved permanent results. Early operation, with the removal of the glands through which the drainage is effected, gives a high percentage of cure. To-day the first thought of the surgeon who makes a diagnosis of cancer is in regard to the adjacent lymphatics. Few cancers destroy life in their original location excepting mechanically; it is principally the secondaries which kill. The great danger, then, is through the lymphatic system in which secondary growths develop and through which the blood stream is invaded. If cancer does not ordinarily cause death in its primary situation the thorough removal of the lymph glands draining the area is of as much importance as removal of the disease itself.

In the alimentary tract the colon is one of the more favorable locations for removal of cancer without recurrence, as the lymphatics of the colon are much less active than those of the small bowel. Fortunately, malignant disease occurs in the proportion of about 17 in the colon to 1 in the small intestine. Approximately about one-half of the deaths from colonic cancer occur from obstruction and perforation before the glands are involved.

A radical change has taken place in the methods of attacking cancers of the rectum, an abdominal incision being first made, and, if the case is inoperable from a curative standpoint by reason of the extension of the original growth or secondaries, a colostomy is performed if there be obstruction. In the curable cases a combined operation is performed from above and below with removal of all the perirectal tissue, fat, glands and fascia with the rectum.

The primary mortality in cancer of the breast need hardly be considered. Of course, there will be unex-

pected deaths from pneumonia, apoplexy, pulmonary embolism or some other unavoidable complication. To the removal of the gland areas belongs the credit for excellent results now obtained. The muscle removal is merely incidental to the thorough operation on the absorbents.

It is difficult to estimate the primary operative mortality of brain injury, as in most cases the operation is partly associated with the injury. Such operations made early are remarkably successful, both in low mortality and in freedom from secondary symptoms (epilepsy, etc.).

The brain, from its functions and anatomic structure, has but limited ability for repair, therefore what is to be accomplished should be accomplished early, before secondary morbid conditions are established. Operations for chronic conditions of the cerebrum are only removed from pessimism by the low mortality and wonderful results in occasional cases.

KIDNEY STONE.

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The time allotted for the consideration of any one subject by this Association is altogether insufficient to permit me to cover the entire field of nephrolithiasis. Rather than attempt this, I have chosen a few thoughts to form the basis for a discussion upon the pathology and symptoms of stone in the kidney. I present this subject not with the expectation of giving you anything new or original, but because I am influenced by the fact that the subject has attracted much attention during the past decade and has never been presented to this deliberative body. From my own experience I am convinced that many of these cases go to their death each year without the true character of the morbid process taking place in the kidney ever being suspected. I must admit, in humiliation, that I am not without sin, although I cast the first stone, and sincerely hope that the light that will be shed in the discussion will dispel all clouds and clarify the atmosphere, making diagnostic errors a relic of the past, so that the presence of kidney stone can be indubitably recognized when present in each and every case, thereby saving many lives.

The early symptoms do not depend on the size and shape of the stone, any more than do the morbid changes that are taking place in the kidney. In one instance the damage to the kidney parenchyma may be inconsiderable, while the symptoms are severe and possibly misleading, so far as destructive changes are concerned. A stone just large enough to prevent its exit

through the ureter into the bladder will give rise to the most distressing and alarming symptoms imaginable, even to the threatening of life, and demanding prompt interference. On the other hand, I have seen the calcareous deposit attain such proportions as to entirely replace the secreting structures of the organ, leaving little else than the framework, without giving rise to serious symptoms. The demand for immediate surgical interference may be less imperative in these cases than in the former. Why one patient with a small stone or possibly nothing at all in the kidney but sabulous matter will suffer so much more than another having an enormous deposit is one of the things I can not satisfactorily account for, unless upon the hypothesis that there is a decided anatomic and physiologic difference in the plan on which the nervous system of individuals is organized, some more highly sensitive than others. Just why one should manifest such evidence of suffering from a comparatively small amount of pathology and another seem to suffer but little pain in the presence of great damage has always been one of the puzzling enigmas to me.

The importance of preserving the integrity of the already damaged organ can not be overestimated, and will be apparent to the most casual observer when his attention is called to the physiologic fact that, according to Purdy and Pellew, the normal kidneys secrete 1,500 grams of urine in twenty-four hours; of this amount seventy-two grams is excrementitious matter, a considerable part of this highly poisonous. The effect of the retention in the economy of any part of this excrementitious matter does not require detailing. If one kidney is thrown out of commission double duty is required of its fellow. It is no uncommon experience to have the second kidney suspend its function by a reflex vascular spasm due to the presence of foreign matter in the crippled kidney or after the removal of a stone. Anuria results and death speedily follows,

with all the ensemble of uremic coma, unless the diseased organ is opened and drained. Then the choked kidney will sometimes resume its function.

The last decade of the century just closed has done much to render the diagnosis of kidney stone reasonably certain by a careful analysis of the clinical manifestations and the order of their onset; the bacteriologic and microscopic findings in the urine, the application of the Röntgen ray, segregator, cystoscope, probing of the ureters, and even incision has played its part in trying to make clear the exact condition existing. We are still far from being able to state unequivocally that the diagnosis can be made in every case, nor do the symptoms always point to the kidneys as the primary seat of trouble. Bruce Clark reports that in thirteen out of twenty-four autopsies stone was found when none had been suspected. The symptoms during life frequently refer to distant organs. Morris, Murray, Noble and Doran have each cited cases where stone has existed for years without symptoms referable to the kidney. Dr. Jacobson, of Guy's, alone reports twenty-five kidneys opened, where a diagnosis of stone had been made and other conditions found. Within the past month I have had just such an experience. The kidney of a woman, 42 years of age, about seven months pregnant, was explored for supposed stone. She had complained for years of a dull, heavy, aching pain over and through the right kidney. A small amount of blood had been seen in her urine from time to time. During the past month the loss of blood had been so great as to seriously alarm all. Examination of the bladder negative, bimanual pressure of the kidney caused severe pain, nothing could be obtained from the right kidney in the segregator. A kidney about three times its normal size was lifted into the wound, incised, and its pelvis explored, with negative result. Believing that I had an enormously enlarged kidney due to stasis from the pregnant uterus and that the in-

tegrity of the organ might suffer, I decorticated and secured it to place. Dr. Johnson, in *Annals of Surgery,* 1899, has reported two cases treated for years for spinal disease that were relieved by removing renal calculi.

In the face of the above facts, if the early symptoms are carefully analyzed and their significance thoroughly understood, the disease will be recognized in the vast majority of cases and operated on, thereby saving the patient much suffering, also kidney destruction and consequent danger. Errors in diagnosis do not creep in where the classical symptoms are present. Here, as a rule, there is little difficulty, but in the atypical cases is where trouble begins and embarrassment follows. Stone in the kidney must be differentiated from the pathologic conditions involving other tissues located in this region. Appendicitis, surgical gall bladder, suppurative and other infectious conditions involving the kidney and contiguous tissues, as well as malignant disease and other tumors. In the female the part the generative organs play must not be overlooked. When the left kidney is the one involved, much less difficulty will be experienced in differentiating. Possibly splenic and perinephritic disease may be a source of some annoyance.

Much contention has occurred in the past regarding the relative frequency of occurrence of stone in the two kidneys. When due to morbid changes taking place in the organ itself the deposit is unilateral. If due to some constitutional dyscrasia, then the calcareous changes are apt to be bilateral.

The deposit takes place, however, in one kidney first and follows later by deposits in the other. Guyon insists that in simple lithiasis both kidneys are involved, and that when anuria occurs the supposed sound one is not working properly, rendering it more susceptible to reflex influences from the diseased organ. Legueu and Albarran contend that in nearly 50 per cent. it is bilateral, basing their estimate on postmorten findings,

while Morris maintains that stone does not form in both kidneys to exceed 10 per cent. His estimate is based on his personal experience in cases operated on. He states further that he has operated on the same kidney two and even three times in nearly the same number of cases.

Morris accounts for the unilateral frequency of kidney stone on the well-known physiologic fact that there is a great discrepancy in the amount of solids eliminated by the normal kidneys, one excreting more at times than the other. This alone, however, is not sufficient to account for the calcareous deposit; other conditions must be present as a pathologic condition of the kidney itself, or the absence of the necessary stimuli to the mucosa to maintain a normal metabolism. The secretion of the uriniferous tubules is in a pathologic condition, and in the meshes of this colloid material deposits the various urinary salts that the urine is no longer able to hold in solution.

Water heavily charged with lime does not influence the deposit of kidney stone. If it did the disease would be bilateral in the vast majority of cases. Nor is the disease any more prevalent in those who eat excessively of proteids and take altogether too little exercise, which tends to the formation of uric acid and urates loading the urine to saturation. There seems to be a hereditary influence existing, several cases having been observed occurring in the same family and running through several generations. Poland has called attention to this striking feature. Leroy d'Etiolles reports eight brothers living in different parts of Europe all suffering from nephrolithiasis, this influence no doubt being exerted through the nervous system. The microbic origin of kidney stone has been maintained by a number of French and German authorities, due to an ascending infection producing local inflammatory conditions that favored the deposit of urinary salts. This is not generally accepted, as these small stones are asep-

tic and remain so until the kidney becomes involved by an ascending inflammation from the lower urinary tract, due to gonorrhea, unclean instrumentation, infection extending from the lymphatics, intestinal canal or through the blood in the effort of the kidney to eliminate.

The attacks of gravel so frequently met with are due to the passage of crystals of uric acid or small stone; a small clot of blood in the kidney or ureter will cause the same pain and uneasiness as calculi. So soon as the foreign substance drops into the bladder relief is prompt, without producing serious inflammatory changes or a prolongation of the suffering, but if unable to effect its escape the pain continues or there is a sense of weight and uneasiness, accompanied by an occasional slight hematuria, that often continues for years; these may be the only symptoms complained of until a severe renal colic and pyemia excites attention, or the presence of pus, mucus and blood in the urine—always an indication of an inflammatory condition somewhere in the urinary tract—forces the patient to seek relief, or the suppurative process having begun may continue through the kidney, resulting in lumbar or perinephritic abscess. Werner, Annendale, Schultzenkrantz, and others have reported cases of this kind; some were mistaken for tubercular conditions of the spine, the error not having been discovered until years after. Stone so large they can not escape from the kidney are followed by the usual train of symptoms of renal colic. A stone not larger than a grape seed may form in the urinary tubules, giving rise to severe symptoms, extensive inflammation and suppuration. Pyelonephrosis always follows long standing calculous disease and can be prevented by early recognition. Structural changes may take place rapidly and fearful havoc be wrought to the kidney. Secondary deposits are always a result of preexisting disease that precipitates urinary salts through some chemico-bacteriological action, due to the presence

of micro-organisms in the diseased kidney. A few cases have been reported by Curnow, Tuffier and others where a blood clot has been the nucleus around which a thick coating of oxalate of lime and uric acid had formed or the deposit may be due to an injury, tuberculosis or malignant disease, in which event it is of phosphatic formation.

The stone usually forms in the pelvis of the kidney or one of its calyces, although tubular deposits often occur. They vary in weight from a grain of sand to five pounds, as reported by Churchill. Those attached to the calyx and formed in the tubuli uriniferi are not very movable, while the smaller ones in the pelvis are freely so and act as a ball valve, preventing the escape of urine and giving rise to great dilatation of the kidney. In one case coming under observation a calculus no larger than a small navy bean so completely blocked the escape of urine as to cause the kidney to dilate to the size of my head. The ball-valve stone would be floated loose and then there was a profuse flow of urine until the dilated kidney emptied itself, only to have the same process repeated. In another case the calcareous deposit had entirely replaced the secreting structures of the kidney, filling and distending the capsule to twice its normal size. The coral-like arms had permeated every part of the parenchyma and was so firmly entwined to the stroma as to render its removal impossible. A nephrectomy was thought to be the easiest way out of the difficulty.

In the main the formation of kidney stone, in addition to the organic basis that has entrapped the urinary salts, consists of oxalate of lime, usually single, forming the harder variety, giving rise to the greatest suffering, and most urgently demand removal. Phosphate of lime, uric acid, also generally single, carbonate of lime, ammoneo-magnesium phosphate, the soft fragile variety, cystine, xanthan, urate of ammonium and mixed

urates. In form kidney stones are as variable as the number encountered, no two are alike either in shape, size or composition, the surface may be smooth, or, if more than one, covered with facets; as a rule, however, they are irregular, rough and uneven, or branched with arms extending into every part of the kidney.

No period of life seems to be exempt. Stones have been found in the kidney of the newborn, and many cases occurring later in life can be traced to childhood. The literature is replete with reports of cases of this kind. It is more prevalent between the ages of 20 and 50 years (Morris).

The greatest difficulty encountered by clinicians in arriving at a correct diagnosis has been in those cases that are not accompanied by the usual stereotyped symptomatology. Some cases simulate typhoid or malarial fever. The chill occurs with marvelous regularity, followed by the pyrexia and sweating stage. The pain is not severe—not greater than the usal ache of malarial poisoning. Within the past year just such a case has fallen under my observation. The woman, about 30 years of age, had been delivered of a child at term, about one week before I saw her. The attending physician states that she had a temperature of 104° F. when he was called to her accouchement. Typhoid was thought of, but did not seem consistent with the history presented by the case. She had frequent severe chills followed by a high temperature and sweat, suggesting malarial fever, with us one of the rarest of clinical experiences. The temperature was not that characteristic of typhoid, but presented all of the characteristics of a septic condition; the exact location of the morbid process we were not able to determine. Puerperal sepsis was eliminated by the high temperature existing when taken in labor. Examination of the pelvic organs was negative. Some three or four years prior I had made a nephropexy on the right kidney. This kidney was now easily palpated, owing to the fact

that it was somewhat enlarged and the flaccid condition of the abdominal wall gave ready access, but was free from pain on firm pressure and had been since the viscus was anchored to place. This organ was suspected and every test was applied that was possible in the country. The urine was examined chemically and microscopically two and three times a week, sometimes daily. The result in each and every instance was negative. We were unable to find any pus, blood or albumin, crystals of uric acid or oxalate of lime until the day of her death, when there was a profuse discharge of pus, blood and renal débris that made the diagnosis clear and removed all doubts as to the probable cause of the clinical manifestations during the preceding four weeks. This was too late, however, to be of any value. The question of a stone and subsequent suppurative condition was frequently considered and dismissed, owing to the absence of pain or tenderness to the kidney on deep firm pressure and the negative urinary analysis. This case has been one of unusual interest, owing to the absence of all symptoms and permitting the patient to go down to an untimely death without effort being made to save. Another difficulty is due to our inability to palpate a normal kidney. While it is contended that it can be done in a small per cent. of men and most women, I am skeptical and do not believe it. Becker and Lennhoff contend that "where it can be done is in people with long, slender trunks." An enlarged and displaced kidney can be readily outlined, except possibly in an individual with very large panniculus. The size of the enlarged organ usually depends on the inflammatory thickening, the extent of the dilation, amount of urine contained therein and the size of the calculus.

Pain is generally the first symptom that manifests itself. At the onset it is very intense, the patient writhing or rolling about the bed or on the floor, evincing the most agonizing suffering. He breaks out in a cold, clammy perspiration. Collapse seems imminent from

the severity of the pain. His anguish and contortions create great apprehension in the minds of his friends regarding the outcome. The pain commences in one or the other side, extending to the corresponding flank and radiating along the ureter into the groin and testicle, retracting the same toward the inguinal canal; the testicle is swollen and painful. The intensity of the suffering is so great as to call for immediate relief by the use of a narcotic. After a time the greatest pain subsides or gradually fades away, only to start up again with renewed force. During the time of most intense suffering the pain radiates into the abdomen and chest, giving rise to the impression that there is some difficulty with the organs of respiration and digestion. The pain is of a boring or twisting character, coming on in paroxysms of greater or less intensity. While convinced that any movement of his body increases his suffering, an unsuccessful effort is made to keep quiet. He rolls himself up in a ball and presses his knees into his abdomen, hoping thereby to lessen his distress. The acuteness of the pain will suddenly stop if the stone or blood clot drops into the bladder. The inflamed and irritated kidney continues a source of much anxiety for days and even weeks for fear there still remains another stone. In other cases the suffering is not great, only a disagreeable unyielding backache that may incapacitate for work, and often exists for an indefinite length of time.

The fear of exciting paroxysms of pain and hematuria prompts the patient to remain quiet. It may continue for years before the real cause of his suffering is discovered. Pressure over the kidneys at this time aggravates the suffering. Elevating the kidney on the tips of the fingers, pressing in the loin, will generally elicit tenderness, even when the local inflammatory conditions are not active. This is a valuable sign in connection with other symptoms.

Inflammatory changes taking place in the kidney will more satisfactorily account for the suffering than attempt its explanation, on the theory that it is due to the spasmodic effort on the part of the kidney and ureter to force the stone into the ureter and bladder. While this latter view is the generally accepted one, it does not satisfactorily account for the great pain in some of the cases met with where the amount of calcareous deposit is so small as to readily slip into the bladder, or nothing at all is found.

The accompanying pyelitis or pyelo-nephritis is a more reasonable hypothesis to account for the intense suffering than to explain it as due to spasm of the ureter during its passage. A stone or many stones will remain dormant in the kidney an indefinite length of time without giving rise to disturbance. The same phenomenon is experienced every day in gall-bladder disease, or barely possible the stone may be quiescent, giving rise to absolutely no sign that would point to the kidney involved. It is a well-known clinical fact that in some unaccountable manner the reflex symptoms locate the difficulty in what is frequently proven on the operating table as the sound kidney.

There exists a frequent desire to micturate that may be due to many causes, as urethral, prostatic and vesical irritation, as well as to kidney stone; the intensity of this desire may so overshadow the other symptoms as to cause some delay in differentiating, especially if there is pus and mucus in the urine. To further substantiate the proposition that the pain is inflammatory in origin and not mechanical, let me call attention to the fact that every surgeon present has opened and explored kidneys where diagnosis of stone had been made and none found. Complete relief, however, has followed drainage of the inflamed organ, possibly some sabulous matter passed after incision that was not detected at the time. Persistent vomiting occurs in severe cases; the ejecta is often bilious. Gastric disturbance is not

so pronounced as in cholelithiasis, although the digestive unrest often leads to anemia, nervousness, palpitation of the heart, loss of weight through fear to eat, without directing attention to the pathology in the kidney. In cases of long-continued digestive disturbance that can not be accounted for as due to organic disease of the gastro-intestinal tract, or to pathology in the hepatic or biliary ducts, be on the alert and investigate the kidney for evidence of stone. I have met with cases where the stomach symptoms so overshadowed those starting in the kidneys that the possibility of stone being the etiological factor was not thought of till a late day. The reflex symptoms are not confined to the gastro-intestinal tract alone. Dr. R. Abrahams has called our attention to a number of cases of renal calculi that were preceded by genital symptoms and treated for the same several days, as though due to specific infection. Morris has also emphasized the necessity of care in cases of inflamed testicle and ovaries in the absence of specific infection.

A small stone will act as a ball valve by dropping into the renal opening of the ureter and block the escape of urine. At this time the urine passed is usually clear, owing to the incarceration of the stone in the ureter obstructing the escape of urine from the diseased kidney. The kidney becomes enormously distended and may lead to some confusion in diagnosis. The temporary plug is floated loose and then there is a deluge; the patient drowns the neighborhood. The flow of urine will be free for a time only to reaccumulate when the stone drops back into its old resting place. It is assumed by many that men suffer more from nephrolithiasis than women; this is perhaps true as to stone in the bladder, but not kidney stone.

Next to pain, hematuria is the most constant symptom of kidney stone. Musser insists that blood in the urine is not an occasional phenomenon, but one that is constantly present. The amount of blood is variable.

At times but a few shrunken, shriveled and crenated corpuscles can be found after prolonged and careful search. In other cases the loss of blood is so great as to jeopardize the patient. In a recent case under my observation at least 50 per cent. of the volume of urine passed was blood; at times the urine would contain less, but never clear up; the very next time it would be almost entirely blood. The amount lost by this man was great. In a suspected case of stone a careful microscopic examination of the urine must be made, first using the centrifuge, taking your specimen from the precipitate. The fact that the blood corpuscles may be few in number, and do not retain their form, but become shriveled and crenated, should be remembered. The blood in the urine often is a symptom of other disease, as purpura, scurvy, smallpox; papillomatous and malignant growths must not be overlooked. Any violent exercise will excite or aggravate the hemorrhage, likewise paroxysms of renal colic, as sneezing, coughing, running, jumping, horseback riding or lifting.

It is through the examination of the urine we will receive the most positive evidence of the exact condition of the kidneys. Urine containing pus, mucus, blood and small particles of calcareous matter is strong evidence that points to the presence of stone. This is especially so if the amount of urine is variable. Traces of albumin, renal and bladder cells are frequently found when blood and pus are detected, but rarely casts. To make more accurate the urinalysis the segregator should be used, as it is one of the most valuable aids we have in arriving at an accurate understanding of the condition of the supposed healthy kidney as well as the diseased one. While the relative frequency of the bilateral formation of stone is not great, still its possibility renders it imperative that we have definite knowledge regarding it. Anuria may occur so suddenly as to demand prompt surgical interference to prevent a fatal issue. When it does occur one kidney is occluded by

a calculus, the other absent, atrophied, or diseased and develops suddenly in those in apparently robust health. According to Cumston anuria in the presence of stone recovers in 35 per cent., and when due to pus in 80 per cent. The segregator makes clear what the diseased kidney is doing and may aid in determining what course to pursue at time of operation. Where the secreting structure has been replaced by the calcareous deposit there will be no urine collected; only blood, pus and débris will be gathered. In the use of the instrument ample time must be taken. The kidneys do not act continuously nor both together, but intermittently; much time will be consumed in collecting the urine from each organ. I have waited forty-five minutes for the urine to begin to flow from one kidney, while at least one ounce had been collected by an almost continuous flow from the other. The presence or absence of blood in the urine from a kidney with a stone is intermittent and must be looked for at different times. The amount of blood is variable, but a few disorganized blood corpuscles can be found under the microscope. Then, again, the entire amount will contain little else than blood. The hemorrhage often is so profuse as to cause alarm. During the past year I have met with two cases where the amount of blood lost was a cause of great apprehension, necessitating prompt opening and draining of the kidney.

Lumbar puncture as a means of diagnosis has been resorted to and supported by no less authority than Le Dentu, who recommends multiple punctures through the kidney for detection of stone. Dr. Morris has long since emphasized the unreliableness and uncertainty of puncturing the kidney or even palpating the same through a lumbar incision. This procedure can only be referred to to be deprecated; a large stone will escape detection even with the kidney in your hand, and at the present time should never be resorted to or coun-

tenanced; all have tried it and can testify to its unreliableness.

Much has been written and claimed for the Röntgen ray as an aid to diagnosis. The indefatigable efforts of Leonard and others to develop this field is certainly commendable and worthy of emulation, although confessing doubt as to its efficiency outside of institutional work. My own efforts along these lines have been very unsatisfactory. The picture must be taken by an experienced operator in skiagraphic work. I believe, however, at no distant day this, as an aid to confirm and disprove diagnosis, will be required in every instance. Calculi composed largely of oxalate of lime cast a darker shadow than the softer varieties and are more readily recognized; the phosphates a fainter shadow, and those of uric-acid formation are more difficult to bring out in the radiograph, the intensity of the shadow of the latter being but little more than the kidney itself. Leonard makes the unqualified statement that the presence or absence of stone can be positively determined in all cases. This must be accepted with liberal discount, as many kidneys have been cut down on and no stone found, when the photographic plate seemed to show its exact location. My own impression of the value of the shadowgraph as a means of diagnosis is in the presence of other symptoms and the pictures the work of a skilled artist. The presence of a foreign body in the superimposed gut will cast a shadow that may be mistaken for a calculus within the kidney or ureter.

The cystoscope may prove of great assistance. The normal or pathologic condition of the bladder is determined as well as the ureter; frequently blood, or blood-stained urine and pus, can be detected escaping from a pouting ureteral orifice. Stones may have been seen and removed from same.

RECAPITULATION.

1. Kidney stone may occur at any time of life from earliest infancy to ripe old age. They are the most fre-

quent and give rise to the greatest amount of suffering of any form of surgical disease of the kidneys.

2. Quiescent calculi are as dangerous to the patient as unsuspected stone, and ought to be removed.

3. The more complete the obstruction of the ureter the more rapid the renal destruction takes place.

4. The clinical manifestations of kidney stone do not depend on its size. A small stone just large enough to prevent its escape and composed of oxalate of lime will cause more suffering and damage to the kidney parenchyma than a very much larger deposit of softer formation, as well as completely disable the patient while the destructive changes are taking place, although the clinical symptoms are not intensely active.

5. While generally unilateral it occasionally occurs in both kidneys. At times the reflex symptoms point most prominently to the sound kidney, the stone being found not infrequently in the side free from pain.

6. The diagnosis is not difficult in the typical cases, but owing to the stone remaining quiescent an indefinite length of time in some makes an early recognition almost impossible.

7. Owing to the fact that kidney stone will put on the livery of infectious diseases renders positive diagnosis difficult if not impossible in those cases where the classical symptoms are absent.

8. There are few diseases of the kidneys more certainly fatal when left alone or more successfully treated when met with proper surgical interference, arresting the destructive changes taking place in the kidney and restoring the viscus to its physiological function.

DISCUSSION.

DR. ALEXANDER HUGH FERGUSON, Chicago—This is one of the most practical subjects in surgery, and deserves every attention that can be given to it to clear it up. This line of surgery is by no means complete from an etiological, diagnostic, or surgical standpoint.

Pain is sometimes very deceptive. It is both local and referred; local over the kidney itself, referred to

the different parts of the body, chiefly along the genito-urinary tract and to the testicle; sometimes toward the midline of the abdomen; at other times towards the ensiform cartilage in the region of the gall bladder and duodenum, and not infrequently the pain is referred to the back. Pain, I believe, is caused in nearly all of the cases of stone obstruction when the onset of the attack is sudden and there is no sepsis by stretching of the pelvis of the kidney. Stretching of any part of the body, even of those parts with the least innervation, causes most excruciating pain, such as stretching of the ligaments of the ankle joint. When inflammation has not yet taken place it can not play a part in the pain of kidney stone. This I have demonstrated by dilating the kidney with water. Take a kidney that is not inflamed, dilate it with water, and it will be noticed excruciating pain is caused as soon as stretching occurs. A quiescent stone does not always give local pain, although it frequently gives rise to referred pain.

In the diagnosis we have to consider other kidney conditions, as, for instance, tumor of the kidney, recurrent attacks of interstitial nephritis, and tuberculosis, hydatids, etc. In tuberculosis and nephritis we may get pain, and blood is usually present in the urine. In the case of tumor we frequently find blood in the urine. The *x*-ray is the best means for the diagnosis of stone that we have so far. There is danger in passing an instrument into the bladder, such as the Harris segregator, the cystoscope, or in catheterizing the ureters. The dangers are so obvious that I need not dwell on them, but exhaust all ordinary diagnostic means first. I have a case in point now which illustrates the difficulty of making a diagnosis. A man, 53 years of age, had pain in the region of the right kidney for three months. It came on suddenly, and sometimes disappeared suddenly, lasting from 20 minutes to an hour; was referred to the testicle, the abdomen, and to the back and region of the gall bladder. It invariably began about twenty minutes after eating, but there were no stomach disturbances of any kind. The right kidney was palpable, enlarged, and tender. The urine showed blood and pus and its secretion was irregular. He has a lancinating pain occasionally. No stone is shown to be present by means of the *x*-ray. The various jolts caused by riding, walking, jumping, etc., gave him

relief. He lost fifteen pounds the last three months. Blood examination showed great anemia. Every afternoon for a week his temperature was between 99° F. and 100°, the skin had a slight jaundiced tinge, and a trace of bile was present in the urine. The diagnosis of stone in the kidney; tumor of the kidney; ulcer of stomach or duodenum, and gallstones was respectively made. It is most likely a tumor of the kidney.

NOTE.—Two days after giving the above report I operated on right kidney transperitoneally and removed a large hypernephroma which pressed on the duodenum and ductus communis choledochus.

DR. W. D. HAINES, Cincinnati, Ohio—I wish to accentuate one point with reference to the absence of symptoms in these cases. I have seen more from the standpoint of autopsies than from the operating table, and during my public work as coroner's physician I made over two thousand autopsies, and, if my memory serves me right, there were about fifty cases of stones of various sizes in the kidneys. In many of them it was impossible to trace the history; but in quite a respectable number, in bringing out the forensic aspect of the work, I was able to trace the history accurately. In those instances in which the history could be traced it was surprising to find how infrequently symptoms were complained of that were referable to the kidney.

In dealing with cases of this kind one of the principal features is to determine if there is a kidney on the opposite side. That is all-important. The essayist spoke of a case where he found it necessary to remove the entire kidney to deal with the stones. If he was not certain there was a kidney on the opposite side, this would have been an unfortunate complication.

I recall a case in which, about a year ago, I removed a dumb-bell-shaped stone from the left kidney, the organ being badly damaged. One or two gentlemen present at the operation suggested that I remove the entire organ. I told them that I was unable to determine whether there was a kidney on the opposite side. There was some secreting substance left in this kidney, and I declined to remove it. It was an error in judgment. Subsequently the patient fell into the hands of another surgeon, in consequence of a discharging sinus, who removed a little stump of kidney. In this instance the reason why I did not know there was another

kidney was because the battery failed to work at the time.

In May of this year I saw a man with a large mass springing from the lumbar region, extending over beyond the median line, which we determined, on careful examination, to be malignant disease of the kidney. He had complained of no symptoms whatever. He ran along for a period of four weeks under careful observation, operation not being deemed advisable. The urine was examined time and again for pus and blood, but they were not found. He was seized with a severe hemorrhage two weeks prior to his death. Unfortunately an autopsy was not obtained in this instance; but a number of physicians who saw the patient confirmed the diagnosis of malignant trouble of the left kidney. There were no symptoms or pain complained of in this region. I mention this case to illustrate the presence of extensive pathologic change in the kidney without symptoms.

DR. WRIGHT (closing the discussion)—In regard to the cause of pain in nephrolithiasis, I maintained in the paper that it was inflammatory in origin and not due to the stretching of the kidney tissue. This was emphasized by citing many cases of kidneys opened, where the clinical manifestations clearly indicated the existence of stone and none are found, or at most a little débris escapes, and the subsequent drainage entirely relieves the suffering. This is especially true if the urinary deposit consists of small crystals of oxalate of lime. A stone so small that it can not possibly produce any stretching effect on the kidney parenchyma may find lodgment in the calyces, the pelvis or ureter and give rise to the most intense inflammatory changes and pain. Its analogue is encountered in gall-bladder surgery. All are aware that the intense suffering of gall-bladder infection is not due to the passage of the gallstones, but that it is due to an inflammatory condition of the gall tracts, that is promptly relieved when opened and drained. The relief is just as prompt when the urinary tract is opened, the tension relieved and drainage established. I am firmly established in the belief that the pain of kidney stone in the large proportion of cases is due to inflammatory changes and not to stretching, as maintained by Dr. Ferguson.

I wish to thank Dr. Harris for his valuable contribu-

tion to the subject and for the large number of cases reported where kidney stones were found at necropsy and none had been suspected during life. Many of these cases are overlooked, because of the absence of severe local symptoms that point to only morbid process taking place in the kidney.

In regard to the case reported where nephrectomy was performed as the easiest way out of the difficulty. I was absolutely certain that the remaining kidney was a healthy one, owing to the valuable assistance of the Harris segregator. The urine had been repeatedly segregated, I knew for a certainty that the left kidney was a normal one, and felt confident that I was warranted in removing the diseased kidney, as it would have been utterly impossible to remove the calcareous deposit. Its many arms reached out into every part of the kidney, entirely destroying the secreting structures of the same, and preventing removal except by complete ablation.

NEWER AIDS TO DIAGNOSIS IN DISEASES OF THE URINARY TRACT.

M. L. HARRIS, M.D.
CHICAGO.

The urinary tract may be subdivided into four parts, namely, the kidneys or secreting part, the ureters or conducting part, the bladder or receptacle, and the urethra with its accessories in the male.

Each of these parts may be the subject of pathologic changes and at times it may be very difficult or even impossible from the symptoms alone to determine to which part or parts the disease is confined.

The mere presence of pus or of blood in the urine affords no evidence as to its origin, and when the symptoms do not indicate the origin some means must be employed which will enable one to investigate each portion of the urinary tract separately.

A number of ingenious devices have been invented recently by the use of which one is enabled to obtain information of the greatest importance concerning the condition of the various portions of the urinary tract.

Among these may be mentioned, first, the catheterizing cystoscopes and the urine segregators. By the use of these instruments one is enabled to collect the urine from each kidney separately and thus to differentiate the diseases of the upper urinary tract, or kidneys and ureters, from those of the bladder, urethra, etc. They also enable one to determine whether there are two kidneys present or only one, and if two whether the dis-

ease is confined to one or involves both, and, if the latter, the extent of the involvement.

Each of these methods, namely, ureteral catheterization and segregation, has its advantages and a proper selection of the method to suit each particular case is necessary in order that the best results may be obtained.

Ureteral catheterization is suitable in a greater variety of cases than is the segregator, for the reason that it possesses many advantages which are independent of the mere collection of the urine.

If the catheter pass without obstruction as far as the kidney it indicates that the ureter is pervious. If it meet with an obstruction, the distance which it enters will locate exactly the seat of the obstacle.

The use of the catheter or bougie is of great aid in the diagnosis of ureteral stones. Notwithstanding the importance of the *x*-ray in the diagnosis of this condition, a number of errors of interpretation of small shadows in the pelvis have been made which might have been avoided had ureteral sounding been practiced.

Again, the catheter may be introduced as far as the pelvis of the kidney and may drain a hydronephrosis or a pyonephrosis, the amount of fluid not only indicating the condition present, but also approximately the size of the cavity drained.

Contamination of the urine with pathologic products from the ureter may be prevented by introducing the tip of the catheter as far as the pelvis of the kidney. When it is desired to collect the urine for several hours or more catheterization is the only method applicable.

It should not be concluded that ureteral catheterization is a simple and perfect method. Aside from the fact that in a small percentage of cases the catheter can not be introduced, there are other disadvantages. For example, the introduction of the catheter often causes a slight hemorrhage which may contaminate the urine; or when left in place a long time the catheter

may cause a severe ureteral colic requiring large doses of morphin to control the pain. The flow of urine may cease suddenly or gradually owing to the lumen of the catheter becoming occluded or to the production of a reflex temporary anuria.

While a catheter is in the ureter on one side, it is never safe to judge of the condition of the kidney on the uncatheterized side by the character of the urine taken from the bladder, because it may not only be contaminated by products from the bladder, but also by products from the catheterized kidney, as a certain amount of urine flows around the catheter and the urine from the bladder to a certain extent is mixed urine.

While the possibility of infecting a healthy ureter or kidney in the presence of an infected bladder can not be denied, still it must be acknowledged that this accident has rarely occurred.

The fact that such an unfortunate accident may happen, however, demands of one the greatest care and circumspection in catheterizing a patient under such circumstances, and makes it incumbent on one to catheterize only when the desired information can not be obtained in any other manner.

The cost of catheterizing instruments and the great skill and dexterity, acquired only by long practice, necessary to use them must unavoidably restrict the use of this exceedingly valuable aid to diagnosis to the hands of comparatively few.

The urine segregator finds a more limited field of usefulness than does the ureteral catheter. There are two kinds of segregators—the Harris instrument, which raises the posterior wall of the bladder into a longitudinal fold, thus forming a watershed between the ureteral openings, and those which attempt to form a watertight septum within the bladder, such as Neumann's, Cathelin's, Luy's, etc.

Theoretically the latter are less reliable than the former, for the reason that it is very difficult to form a

water-tight joint by pressing a smooth edge against a mucous membrane naturally thrown into folds (such as the bladder wall when that viscus is empty), and in practice this is found to be true.

My experience is based on the use of the Harris instrument. In order that the results from the use of the segregator may be satisfactory and reliable, the cases in which it is used must be properly selected.

For instance, those cases are not suitable for the segregator in which the ureteral openings are abnormally close together or so arranged that an efficient septum can not be raised between them; or cases in which the base of the bladder is so thick or distorted that a suitable watershed can not be made; or cases in which the bladder is too small or contracted to permit the opening of the instrument; or cases in which there are intravesical growths which interfere with the proper working of the instrument; or cases of irregular or excessive enlargement of the prostate. Some of these conditions render catheterization of the ureters impossible as well.

The most satisfactory results are obtained with the segregator in diseases of the kidneys when it is desirable to know whether the affection is unilateral or bilateral; when one wishes to learn whether certain pathologic products come from the kidneys or from the bladder, and when one wishes to determine the amount of work done by each organ. In such cases the results are very satisfactory and the method has the advantage over catheterization in that it requires much less practice and skill.

By this it is not intended to convey the idea that segregation is a very simple procedure; on the contrary, it requires the most careful attention to the minutest details, and I am convinced that the reasons why some have failed at times in the use of the instrument are that an unsuitable case was selected; or that some of the details were omitted; or that too much was expected of the instrument. It should also be remembered that

an instrument is always only an inanimate mechanical device which, when properly used, furnishes certain data, but a correct interpretation of the data depends entirely on the knowledge and experience of the operator.

As has just been stated, there are a number of conditions unsuitable for segregation and some in which catheterization is also impossible. It is necessary to recognize these conditions in order to make a suitable selection of the method of procedure in the case in hand, and to do this a cystoscopic examination is frequently absolutely essential.

In every case in which there is the slightest doubt as to the condition of the bladder, a cystoscopic examination should precede an attempt to segregate the urines. So important is this, in my opinion, that I look on a cystoscopic examination as the keystone of the diagnostic arch in diseases of the urinary tract. It is often truly remarkable the amount of information an expert at times will gather not only in regard to the involvement of the kidneys, but of the side affected and approximately of the relative amount of work done by each kidney by a simple cystoscopic examination. I feel certain that any one familiar with its use would unhesitatingly choose the cystoscope as the most valuable of all instruments of diagnosis in this line of work.

Having collected the urine by one or the other method the next question to determine is the functional activity of the kidneys both combined and separately. The recent attempt to explain the secretion of urine entirely by osmology has not met with general acceptance, and the cellular activity theory of Heidenhain is still necessary to a satisfactory explanation, although osmotic tension is undoubtedly an important factor. Such being the case, the amount of solids eliminated with the urine must represent the functional activity of the kidneys.

Up to quite recent times dependence was placed on

the specific gravity and on chemical analysis to determine the amount of solids present in the urine, but recently another method has been introduced. It has been known for a century or more that the freezing point of a solution of any substance is lower than that of the solvent, but it is only during the past few years that the laws of this phenomenon have been known. It is now known that the freezing point of a liquid bears a direct ratio to the number of molecules held in solution.

Koranyi was the first to make use of this fact as a means of determining the amount of solids held in solution in the urine, blood, etc., and the method has since come into more extensive clinical use under the term cryoscopy. The technic of the procedure need not be described here. The real value of cryoscopy above that of other methods when applied to the urine is questionable.

Casper and Richter,[1] however, claim that it is practically the only method of any value in determining the total solids of the urine, and, therefore, the amount of work done by the kidneys, and would have us believe that the estimation of the percentage of urea, chlorids, etc., is of no significance. Their argument is that the amount of nitrogen containing substances and of chlorids in the urine may vary so widely under varying conditions of diet, etc., even in health, that their estimation is without practical significance. These substances, however, form more than 85 per cent. of the total solids of the urine, and if their estimation by one method is of no significance surely their estimation by another method is equally without value.

Cryoscopy is but another method of estimating the total solids of the urine, for the freezing point is an index of the number of molecules in solution. Cryoscopy when applied to a single specimen of urine is of no more

1. Functional Diagnosis of Kidney Disease, 1903.

value than is the specific gravity of the same specimen. In fact, as Clowes[2] says: "On comparing the freezing point directly with the specific gravity a constant relationship is found to obtain which only varies within such narrow limits as almost to fall within the range of experimental error."

Each 0.01 of the decimal of the specific gravity of urines depresses the freezing point 0.75 C. Consequently, if the decimal part of the specific gravity be multiplied by the constant 75, the freezing point will be obtained. This applies practically to all conditions except when sugar is present or albumin in considerable amount. In order to be able to attach any value to the amount of solids contained in a given specimen of urine, however, one must take into consideration the factors, time and the body weight of the patient. It is very interesting to note how the product of these three factors averages up from hour to hour under ordinary circumstances. The amount of solids in a specimen of mixed urines is not of so much diagnostic value as is a marked difference between the amounts found in the separately collected urines. It is here, again, that the value of ureteral catheterization or segregation becomes evident, for under normal conditions each kidney secretes approximately the same amount of urinary solids in a given time. If there be a marked diminution in the percentage of solids found in the urine from one kidney, when compared with the percentage of solids found in the urine from the opposite kidney, it is positive evidence of an abnormal kidney.

One can not tell, however, from a determination of the percentage of solids alone whether or not the combined work of the two kidneys is sufficient. If by renal insufficiency is meant the failure to remove from the body all of the excrementitious substances which normally should be eliminated by those organs, then renal

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2. Amer. Jour. of Physiology, 1903, vol. ix, No. 5.

insufficiency, except it be of high degree, can not be determined simply by an examination of the urine, because it is impossible to know how much material has been brought to the kidneys for elimination.

We, therefore, turn from the urine back to the body to determine, if possible, whether any of the excrementitious substances have been retained. Evidence of such retention is sought along two lines: 1. Symptoms due to the substances retained. 2. The presence of such substances in the body fluids in increased amounts as determined by physiochemics.

It is unnecessary to mention all the symptoms of imperfect elimination, but attention is particularly directed to increased arterial tension as shown by the sphygmomanometer.

Under the second heading we have to consider cryoscopy as applied to the blood. The freezing point of the blood in health is found not to vary materially from —0.56 C. This uniform point is maintained by the kidneys acting as a regulator of the osmotic tension of the blood. When the kidneys fail to eliminate properly, or, in other words, become insufficient, the retained substances increase the osmotic tension of the blood, which is made manifest by a lowering of its freezing point.

Based on a somewhat limited number of observations, it is assumed that a lowering of the freezing point of the blood to or below —0.60 C. is an indication of retained excrementitious products, or, in other words, of kidney insufficiency.

Were kidney activity the only factor involved in maintaining the normal freezing point of the blood, the problem might prove to be a simple one, but such is far from being the case. Some of the factors influencing the freezing point of the blood are unknown, others are but slightly known, but that the freezing point varies considerably is certain. For instance, in the anemias, or when the percentage of hemoglobin is diminished,

the freezing point of the blood is found to be much higher—0.52 or more.

If 0.04 of a degree is sufficient to mark the dividing line between normal blood and that of renal insufficiency, and if the anemias can raise the freezing point 0.04 or 0.06 of a degree, it is easy to see that marked renal insufficiency may be associated with anemia, and the blood still have a normal freezing point or one even above normal.

This was well shown in one of my cases. A young woman had had but one secreting kidney for some time, and that one badly involved, as it furnished but a small amount of albuminous urine containing numerous casts and blood cells. She was in an extremely low condition, yet the blood froze at —0.53 C. There was a high degree of anemia, 2¼ million reds and 40 per cent. hemoglobin.

On the other hand, the freezing point of the blood may be found as low as —0.60 C. or lower with normal kidneys in diseases of the lungs or heart, in which oxidation is below normal; in some of the fevers; in malaria and in diabetes (Bouchard).

From this it follows that until we know the influence of other factors on the freezing point of the blood so as to make the necessary corrections therefor, we are unable to affirm that there is renal insufficiency on the results of cryoscopy of the blood alone.

In order that reliable deductions in regard to renal sufficiency or insufficiency may be made from cryoscopy of both the urine and the blood, it is necessary to know concerning the former the amount secreted in a given time, together with the weight and general diet of the patient, and concerning the latter the amount of hemoglobin present and such other factors as may influence the freezing point.

When cryoscopy is applied in a differential sense to the separate urines, it becomes of great value in determining the amount of work done by each kidney.

The use of phloridzin as a test of renal activity was first employed by Klemperer. As is well known, phloridzin, when injected subcutaneously, produces a temporary glycosuria, and the amount of sugar eliminated by each kidney depends on the amount of active parenchyma possessed by the kidney.

Ureteral catheterization or segregation, therefore, must be used in connection with the phloridzin test, for this test becomes of value only when the amount of sugar contained in the separate urines is compared. When used in this manner the test has some value. The methylene blue test is purposely omitted, as its value is probably not great. The value of the *x*-ray in the diagnosis of renal and ureteral calculi has become firmly established and need only be mentioned here.

In conclusion, then, the newer aids to diagnosis in diseases of the urinary tract may be arranged in the following order, according to their value:

1. The cystoscope.
2. Ureteral catheterization or segregation with comparative analyses of the separate urines.
3. The *x*-ray.
4. The phloridzin test.
5. Comparative cryoscopy of the separate urines.
6. Cryoscopy of the blood with the necessary corrections made.

DISCUSSION

Dr. B. B. Davis, Omaha, Neb.—There is one point on which I desire a little information from Dr. Harris, in connection with this paper. I have been using the Harris segregator a great deal in making tests as to the relative condition of the two kidneys, and I want to ask him whether in his experience he has found temporary anuria present in any of these cases, enough to interfere materially with the value of the test.

I never had had an experience of this kind until last Saturday, when I used the segregator and kept it in three-quarters of a hour, and during all that time not more than ten drops of urine was segregated. I changed

the position two or three times, thinking I might be causing pressure over the orifices of the ureters. But after withdrawing the instrument and passing the catheter, I found there was absolutely no urine in the bladder, nor was there any for probably nearly ten minutes, when it began to trickle, and I wondered whether this was a frequent occurrence. The patient was a nervous woman, who had had a great deal of trouble with the kidney, and a great deal of pus in the urine, etc. This is the first time I have met this phenomenon, and I wondered whether it occurred frequently.

DR. HARRIS (closing the discussion)—I have seen a temporary anuria in the use of the segregator, which lasted sometimes ten or fifteen minutes. I have seen that a number of times, and I have also seen it last longer, as much as thirty or forty minutes. It is not very common. I have also seen complete anuria follow the introduction of the ureteral catheter, which has lasted for several hours or until the catheter was withdrawn.

THE METHODS OF EXPLORING THE ABDOMEN, AND A NEW ONE.

ALEXANDER HUGH FERGUSON, M.D., C.M.
CHICAGO, ILL.

Gentlemen:—The aspirating needle and trocar and canula were among the first instruments used for the conditions. In the evolution of abdominal surgery the diagnosis and treatment of surgical intra-abdominal knowledge of clinical medicine became more and more coupled with pathologic conditions, and then on the presence of certain symptoms and signs the surgeon made bold to use the knife. While the large majority of the former uses of the aspirator, trocar and canula no longer pertain, still their great practical value is occasionally exemplified. The use of the trocar and canula is clearly obvious in cases of ascites. After the fluid is removed the pathologic condition may frequently be palpated through the abdominal wall. A small trocar and canula serve an excellent practical purpose in drawing off fluid from large ovarian cysts which compress the liver, diaphragm and stomach, dislocate the heart and bulge out the ribs. Let me here mention a case in point of a large ovarian cyst in the practice of Dr. S. R. Peacock, of Ladoga, Indiana, which I saw, in consultation, at her home. The patient, a woman, 63 years of age, was so distressed from the size of the cyst that death was imminent. The case was inoperable in her condition, but after allowing the fluid to escape through a small canula into abundant aseptic dressings, she rapidly improved and in three

days was able to travel to Chicago, a distance of a hundred and thirty miles, and stand successfully an operation for the removal of the cyst. At the same time the gall bladder was emptied of 1,015 gallstones, and the left breast, which was carcinomatous, was amputated. She left the hospital in two weeks. It is now over three years since her operation, and she still enjoys excellent health. While this case is not strictly within the intention of this paper, still it points out the value of the trocar and canula. The aspirating needle also has its obvious uses for exploring abscesses of the liver and hydatids.

Valuable information of diseases, tumors and conditions of the organs within the abdomen is obtained by manual and instrumental means, carried out through the natural openings leading into the vagina, rectum, urethra, and esophagus. Here is a field for elaboration, but I must desist, and proceed to say something about the superlative and deserved recognition explorative laparotomy has in modern times obtained, because by this means alone can we feel and see the normal and abnormal conditions of the peritoneum and of the organs within it.

It is regrettable that the abdomen needs to be opened for diagnostic purposes, but experience teaches us the wisdom of it in doubtful cases, and also in that it reveals grave diseases in their early stages.

In selected cases local anesthesia enables us to explore almost every region of the abdomen. It has stood me in good stead in a large number of instances.

Abdominal sections are, of course, made to rectify a condition, to remove disease and to ascertain what, if any, is the matter within the abdomen. The same operative principles pertain here as in other parts of the body, in that damage to muscles, nerves, and vessels is carefully avoided. The normal segments of the structures of the abdominal wall are longitudinal and trans-

verse, but it must be remembered that a normal cleavage line is oftenest deficient (congenitally), repair after dissolution of contiguity is frequently weak, and should, therefore, be avoided in making incisions for explorations, if for nothing but to avoid postoperative herniæ, the umbilical region excepted.

There are many cogent reasons why an incision through the umbilical ring affords us the greatest facility for exploring the abdominal cavity. At the navel the external abdominal wall is thinnest on account of the absence of fat and muscle; there is no danger of injuring important structures; it is practically at the center of the abdomen; the hand has the shortest distance to travel to reach the greatest number of organs and tissues, and upon incising the umbilicus and its ring and properly suturing the wound, it is finally, when union is complete, much stronger and has less danger of hernia than this locality normally possesses. An incision about four centimeters (1½ inches) in length, which admits one or two fingers, enables the surgeon in spare women, who have borne children, to feel and palpate every organ within the abdomen. In this way I have determined with some degree of accuracy the condition of the liver, gall bladder and ducts, stomach and its pylorus, pancreas, spleen, kidney, bowels and appendix, uterus and its appendages. Cancer of the stomach and large bowel, gallstones, stone in the kidney, cancer of the peritoneum and tubercular peritonitis, I have thus diagnosed.

If the patient be a stout, fleshy adult female, or one who has not had children, or a male, over 5 years of age, an exploration through so short an incision is only of limited usefulness. The abdominal contents of men are much more difficult to explore than those of women, irrespective of the site of the incision through which the manipulation is executed.

Incisions through the linea alba, as first performed

by the older operators and for many years followed by others, produce more herniæ than incisions through any other portion of the abdominal wall, because fibrous tissue is poorly nourished, and takes a longer time for solid scar formation. This also necessitates keeping the patient in bed longer than is required.

McDowell's incision in his first few cases was nine inches long and three inches to the left of the rectus muscle. In his remaining cases he chose the median line. (T. Spencer Wells, 1882, page 286.)

Dr. McGraw (*Journal American Medical Association,* June 8, 1887), in dealing with "Some Points in Laparotomy for Visceral Injuries," points out the value of other than median incisions in exploring and dealing with wounds of the immovable viscera, such as the liver, gall bladder, kidneys, suprarenal capsules, cardiac portion of the stomach, lower three-fourths of the duodenum, the pancreas, the colon, ascending and descending, the rectum, uterus and bladder.

Atrophy of the rectus muscle between the scar of the incision and the linea alba has not been found to occur in my experience, extending over many years. I never have had a hernia following a section through the rectus muscle where drainage was not used.

Ramsey (*Lancet,* Nov. 30, 1895) pointed out the disadvantages of the median incision for general abdominal operations, as compared with incisions through muscular tissue, thus avoiding postoperative hernia.

Dr. Nancrede (American Surgical Association, May 14, 1887) discussed the medicolegal considerations of exploratory incisions. He pointed out that experience has shown that life can be saved by prompt operative interference, and that we can not wait for time to determine the diagnosis. He narrated a case in which an attorney tried to exonerate his client from murder on the ground that death was not due to the stab wound,

but to peritonitis caused by the escape of the contents of the stomach and effused bile.

Dr. Theodore Kocher (*Correspondenzblatt f. Schw. Aertze,* Oct. 15, 1898) urgently advocated the use of exploratory incision in doubtful cases of diseases of the stomach through the median line. The Mayo brothers, of Rochester, Minn., have for several years pleaded for early laparotomy for suspected carcinoma of the stomach.

Dr. J. W. Meigs (*Journal American Medical Association,* Aug. 13, 1898) pointed out the value of exploratory incisions in doubtful cases of obstruction of the pylorus, making a median incision and, if necessary, a cut through the rectum.

Dr. Howard A. Kelly (*Medical News,* Dec. 16, 1899) emphasized the importance of explorative incisions and examination, first, by simple inspection of the structures presented in the wound; second, the examination of structures that can be brought into the opening, such as ovaries, tubes, cecum, appendix, etc.; third, by the insertion of the hand; and, fourth, by the insertion of the forearm in order to reach the liver, the gall bladder, the kidneys and spleen.

When the abdomen is opened for any purpose whatever, except for infection, how easy and how safe it is to pass the hand and feel for complications. The linea semilunaris is not a desirable site for abdominal incisions, on account of the thinness of the abdominal wall; it being mostly composed of fibrous tissue, and hernia is more liable to follow than when muscle is gone through longitudinally.

Woolsey (*Annals of Surgery,* January, 1898) dwelt upon the advantages and disadvantages of abdominal incisions then employed. He pointed out that the aponeurosis is less resistant than muscle. that for appendicitis the vertical incision is objectionable, because it cuts the tenth, eleventh and twelfth dorsal nerves,

which supply the rectus muscle, and the scar is almost entirely fibrous, hence weaker than when both muscle and fibrous tissue are gone through.

Bardenheuer advised extraperitoneal explorative incisions for examining abdominal organs without cutting through the peritoneum. In consideration of the safety with which the peritoneal cavity is now opened, the long transverse incisions of Bardenheuer (lumbar, costal, iliac, and suprasymphysis) have not gained favor with surgeons. It is true, however, valuable information may be gained by this means. Kustner's[1] and Pfannenstiel's[2] incisions are both transverse above the pubes in the pubo-abdominal fold or hair region, and differ only in the manner of entering the abdominal cavity after the external incision is made. The former cuts vertically into the abdomen and the latter divides the sheath of the rectus muscle on each side, and the rest vertically.

In consideration of the less liability of postoperative hernia above than below the umbilicus, a median incision here is less objectionable. When the anterior abdominal wall is opened external to the median line, separation of muscular fibers should invariably be planned and executed whenever possible. In clean explorations it is important to follow out some method of gaining information just as soon as the abdomen is opened. The one which I pursue is somewhat as follows:

1. See and feel whatever is presented in the wound.
2. Retract one edge and then the other of the wound. *See and feel.*
3. Elevate the abdominal walls. *See and feel.*
4. Turn the patient (when not satisfied with 1, 2 and 3) from side to side. *See and feel.*
5. Elevate the pelvis (Trendelenburg) in pelvic work and herniotomy. *See and feel.*

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1. Centralblatt f. Gynäkologie, 1902. 2. Ibid.

6. Arch the body with a sandbag (Robson) in dealing with gall bladder and ducts. *See and feel.*

7. Place the patient in a semi-sitting position and the body arched backwards. *See and feel.* (It is in cases of exploration for diaphragmatic hernia that this position is valuable.)

8. When in any position, structures can not be easily seen or felt, pass the hand and forearm and feel.

9. Illuminate the field under examination. *See and feel.*

It is by following some such plan as this that advancement is made, intellectual observations are registered, and our own education enhanced for the utility of others.

I shall now enumerate a few of the manipulations and observations that should be made when the abdomen is opened for purposes other than exploratory.

Through the incision for exposing the gall bladder and ducts, it is my practice to see and feel all I can within a reasonable radius. It was by gentle elevation of the abdominal parietes and observing things as they were that I discovered what is known in literature as "flexion of the gall bladder" in two distinct cases. This incision should not be closed without examining the stomach, pylorus, duodenum, hepatic flexure of the colon, pancreas, and should there be a suspicion of disease of the kidneys, appendix, uterus and its appendages, they, too, should be felt by the hand of the operator, and, when the condition of the patient permits of it, if necessary, surgically treated. It is not uncommon that appendectomy can be performed through this incision without even extending it downwards, but surgery of the uterus, ovaries and tubes had better be undertaken through a separate incision. In one case, however, I found, through such an incision, a stone in the right kidney, and, holding with my right hand the kidney against the lumbar wall, I was able to cut down

on it at the usual site with my left hand, remove the stone and drain the kidney through a much smaller incision than would have been necessary had I proceeded in the usual manner. The patient made a nice recovery from what otherwise would have been unsuccessful, on account of the incomplete treatment for her two distinct ailments. On the other hand, the bile ducts may be explored through the incision usually made to reach the kidney. I have done this by making an incision through the peritoneum in front of the kidney, reaching inward to the gall bladder, discovering gallstones and removing them through a buttonhole incision made over the fundus of the gall bladder as it was held by the exploring hand against the anterior abdominal wall. I have often removed the appendix through the lumbar incision for kidney work, as well as feel of all the important structures and organs in every intra-abdominal region between the diaphragm and the pelvic floor.

Should the gridiron incision (McBurney) for appendicitis be selected and, at the same time, it is deemed wise to explore the entire abdomen, the sheath of the rectus muscle must be split across, to give sufficient room for the entrance of the hand and forearm. If the gall bladder is found at fault, it is drained through a buttonhole incision. Should the pelvic organs be displaced or diseased, the incision is further enlarged by splitting the anterior sheath of the rectus down to the pubic bone. It will then be found that the remaining structures will so yield to traction as to expose for manipulation the uterus and its appendages. Through this enlarged gridiron incision I have repeatedly removed small fibroids, shortened ovarian ligaments, bisected ovaries, performed anterior transplantation of the round ligaments, salpingostomy and hysterosalpingostomy before or after removing the appendix. It is needless to remark how beautifully all these structures fall together with small catgut suture.

In cases presenting the clinical evidences of both appendicitis and gallstones, I make a "compromise incision" through the right rectus muscle opposite the navel, of sufficient length to admit the hand, which easily reaches the gall bladder and appendix respectively, and, if need be, the other organs within the abdomen.

The ordinary incision for pelvic procedures is an excellent one, through which the abdominal organs are explorable by hand. In patients over thirty years of age the condition of the appendix and gall bladder should always be ascertained. If there is any suspicion of disease of the appendix, such as club-shaped, cord-like in feeling it, constricting bands around it, etc., remove it. When gallstones are felt, slip the gall bladder through a buttonhole incision and remove them. Should a left or right femoral hernia be a complication, cut through the left or right rectus muscle, as the case may be, pull the sac within the abdomen, make a slit through the peritoneum at its neck, suture the femoral ring, and then the hole in the peritoneum, and leave the sac alone, thus curing a femoral hernia.

Through the enlarged incision for the radical cure of oblique inguinal hernia, complete abdominal exploration may be carried out, and operations performed for gallstones, appendicitis, etc. In order to admit the hand, the incision needs to be enlarged in one of two directions: (*a*) By detaching the internal oblique and transversalis muscles from Poupart's ligament, and (*b*) by cutting the sheath of the rectus muscle transversely, and then downward to the pubic bone.

When an umbilical hernia is being operated, there is no excuse for not handling the internal organs to ascertain their condition, and there and then rectify whatever may be wrong. In support of this advice, ample proof can be furnished from my own experience and from that of others.

If the transverse incision in the tubo-abdominal fold

or through that portion covered with pubic hair be selected, the inside of the bladder can be exposed better than by any other method. Should it be used to explore the pelvis, much more work and exploration can be done through it than has been generally admitted. I should not hesitate, when indications warranted my doing so, to pass my entire hand and forearm and explore the entire abdominal cavity through the transverse incision. The recti are not supplied with posterior sheaths in this region, and when the anterior sheaths and linea alba are severed all the other structures yield to traction and furnish ample room for these procedures. In the same way the sheath of the rectus may be cut at the upper end of a gall bladder incision when it is found that the common duct is involved, and thus ample room is obtained.

In performing epididymectomy for tuberculosis, one should find out the condition of the vas deferens and the vesiculæ seminales as well. I, therefore, select an incision over the inguinal canal, lay it open, pull the vas deferens, testicle and epididymis through it, and through the internal abdominal cavity explore the vesiculæ seminales with the finger, or use retractors and see it. After opening the peritoneal cavity, at the internal ring, the appendix, ureter and base of the bladder may be examined, and the appendix removed, if necessary.

A NEW METHOD FOR EXPLORING THE ABDOMINAL CAVITY.

On June 2, 1904, I had the honor to deliver the Oration on Surgery before the Minnesota State Medical Association, and on that occason I referred to this method as follows:[3]

"In our daily round of work we meet cases requiring colpotomy, anterior or posterior, to remove myomata, cysts or what not, and these same cases often give a history of stomach, gall bladder, kidney or bowel disturbances. An examination of the abdominal organs would

3. St. Paul Medical Journal, August, 1904.

be highly satisfactory, although oftentimes one feels hardly justified in opening through the abdominal wall for that purpose. The problem is solved by passing the hand and entire forearm into the abdominal cavity through the vagina (Fig. 1). In order to furnish enough space for this purpose, it is imperative to cut through the mucous membrane of the vagina its whole length on each side postlaterally (Fig. 2.) The mucous membrane being severed, the other structures stretch at once. The bare arm, being smeared over with sterile vaseline, glides in with ease. I have within the last three years, both in private practice and at my public clinics, passed my hand through the vagina to the diaphragm and palpated all the abdominal organs. In one case, after detecting gallstones, I cut down on the gall bladder, and pushed it, full of biliary calculi, through a buttonhole incision in the abdominal wall. In another case, a cancer of the rectum was present, and before removing it it was indicated to learn the condition of the internal organs. I passed my hand as above mentioned, and detected cancer of the liver and gall bladder.

"Still a third case, a maiden lady of mature years, had a vaginal outlet so small that a digital examination could not be made without an anesthetic. I then found cancer of the posterior lip of the cervix. Through an anterior colpotomy I passed my hand, having, of course, slit the vagina on each side, and I found the anterior surface of the stomach involved with a firm, hard tumor, evidently cancerous in character, and the lymphatics were also extensively enlarged, no doubt, with the same dreadful disease.

"For the purpose of pointing out the value of this method of exploring the abdominal cavity, the three cases referred to are sufficient examples, and I shall not relate others. In the first case, a second operation for gallstones was avoided, and in the other two in-

stances a major operation was prevented, which, if performed, would surely have injured the art of surgery."

It was only the other day that I saved a young surgeon from the chagrin of the mistake of opening down on a large, thick omentum for a tumor, and the patient the danger of the procedure by this method of exploration.

Inasmuch as anterior colporrhaphy and perineorrhaphy were marked indications in this case, it was but a little additional trouble to pass my hand and forearm through an anterior colpotomy incision and explore the abdominal cavity, as illustrated by this drawing, and that, too, without making lateral incisions in the vaginal mucous membrane, because the vagina was roomy enough to admit my hand and forearm.

DISCUSSION.

DR. R. C. COFFEY, Portland, Ore.—I would like to ask Dr. Ferguson under what circumstances he would make an exploration such as he has described, inasmuch as we know the vagina can not be thoroughly sterilized, and that an abdominal incision is fraught with so little danger?

DR. A. L. WRIGHT, Carroll, Iowa—I have listened to this paper of Dr. Ferguson's with interest and have been much amused at the extremes one may go in trying to attract attention, for surely this is the only object the doctor could have had in view in suggesting so unsurgical a procedure as punching a hole in the vagina large enough to admit the hand and arm, dragging them through an unclean mucous cavity—that all know can not be rendered aseptic—for the purpose of exploring the upper abdomen. Although I have had no experience with this method of examinations, I can only speak disparagingly of it. I am impressed with the thought that this procedure as recommended by the doctor is so much more formidable and one attended with so much greater danger than a simple incision that we should not countenance it. I do not look with favor on the procedure.

DR. C. O. THEINHAUS, Milwaukee, Wis.—I wish to thank the President of the Western Surgical and Gynecological Association for his kind invitation to take

part in the discussion. In regard to puncturing ovarian cysts for diagnostic purposes, we all know that it is not entirely void of danger in case the ovarian cyst is infected. At one time one advised, for the purpose of diminishing the enormous size of the abdomen in such cases gradually, to puncture large ovarian cysts twenty-four hours before operation.

I followed this advice in one case, but immediately after the puncture the patient began to complain of such enormous pain in the abdomen that I reached the conclusion that a delay of the operation in this case might be dangerous, and operated immediately. The operation revealed as cause of the pain an adhesion of the cyst to a part of the gut, which after emptying of the cyst became strangulated by the adhesion.

That, furthermore, in all cases of cysts in the abdomen, in which we have the slightest suspicion that an echinococcus may be present, the puncture of the cyst for diagnostic purposes is out of question, because of the danger of dissemination of the contents of the cyst over the abdomen, is very well known.

In regard to exploring the abdomen by way of posterior colpotomy, as suggested by Dr. Ferguson, I would like to offer one suggestion which was tried and carried out by Von Ott in St. Petersburg. After opening the abdomen by posterior colpotomy he introduced electric lights fastened to the retractors into the vagina and the abdomen, and at the same time using electric light fastened to his forehead he was enabled to get a clear view of the field of operation and to diagnose by this means conditions which were difficult to diagnose otherwise.

DR. FERGUSON (closing the discussion)—The question asked by Dr. Coffey is a pertinent one, and in my paper I mapped out the conditions under which I would make this exploration through the vagina. I mentioned three conditions in which I thought it was indicated. Not infrequently we have to open the cul-de-sac, either anteriorly or posteriorly, for the removal of small fibroids. It was for such a case that I explored a little farther than usual, when the diseased appendix came down, and I removed it through the vagina. In another case there was a suspicion of gallstones—in fact, a clear clinical history of gallstones, and after removing the fibroids in this case through an anterior

colpotomy incision I passed my entire hand and forearm up to the gall bladder and found stones in the gall bladder without complicating the ducts. The operation was simply a cholecystotomy, and, while my hand was *in situ,* I cut down upon the gall bladder, turned it out, removed the stones, and stitched the gall bladder afterwards.

Take the case of carcinoma of the rectum in which there was considerable emaciation and suspicion of disease of the internal organs. Passing the hand through the vagina in such a case is a safer method, from the standpoint of shock, and more cleanly than opening of the abdomen externally. External abdominal section is by no means as free from danger as Dr. Wright would have us believe; and the vagina can be made comparatively cleaner according to our present methods. By putting sterilized vaselin over the entire hand and forearm the hand can be passed in very readily. As has been said, the proof of the pudding is in the eating of it. I have never had an infection of the peritoneal cavity follow such an exploration.

PERITONEAL ADHESIONS: THEIR CAUSE AND PREVENTION.

ARTHUR E. HERTZLER.

KANSAS CITY, MO.

The term "adhesion," as generally used, implies some pathologic process. To speak of a physiologic adhesion in the peritoneal cavity is no more warranted than to speak of the union of any other embryologic folds as an adhesion. Still, in the course of normal development, serous surfaces at one time separated afterward become united, and it is to this process that the term physiologic adhesion may properly be applied.

The study of adhesions is, therefore, a pathologic study, and, like all pathologic problems, the abnormal is better understood if a clear picture of the normal can be obtained. Unfortunately the so-called physiologic adhesions are involved in as much obscurity as the pathologic. Henle intimates that adhesions in the normal abdomen are the result of the exudation of plastic materials. This may be true, but there is no evidence either for or against the theory, and if such an occurrence could be proven it is questionable if it could be regarded as physiological. In the attempt to determine this point embryos, both human and those of the lower animals, were sectioned, but without giving any definite results. In each instance the process either had not yet begun or it had been already completed.

I have studied particularly the descending colon, hoping that the embryonal processes here would resemble most closely the condition in the adult, since this is

the last place which becomes adherent in the process of development. The results were invariably negative.

It contributes to clearness to distinguish agglutinations from adhesions proper. The former may occur without the disappearance of the endothelial plates. It is probable that this may be due to a specific change in the chemistry of the cells. In adhesions the endothelial cells are destroyed, permitting an intermingling of the fibers of the basement layer. What determines the one and what the other is difficult to say. It is possible that the agglutination is but an early or an incomplete adhesion and that a continuation of the irritation may mark the change from one process to the other. An appreciable time is necessary for adhesions to form, while agglutination may occur in a very few minutes. Peristaltic action may be sufficient to tear up an agglutination of brief duration, but not of an adhesion. A very weak force will, of course, hold the intestines in apposition when they lie paralyzed, but a much greater one is required when there is active peristalsis.

In order to be able to observe the processes involved in adhesion formation I made use of a method which, so far as I know, has been used by no other worker and which, in consequence, may bear presentation. It consists simply in sewing a glass window into the wall of the abdomen of an animal. I employed a glass disc with a metal rim. Holes were drilled into this rim to allow the sutures to pass. It is cheering to note that such a procedure, which appears cruel, seems to inconvenience the animal very little. Through this opening many things relative to the formation of adhesions, and particularly as to the breaking up of adhesions, become clear which heretofore rested only on conjecture. On the other hand, many difficulties spring up to obscure the result which are not at once apparent. Still the formation of the exudate about irritated parts, the formation of agglutinations and particularly the effect of increased peristalsis on the loosening of adhe-

sions, may well be observed by this method. A scientific basis for the recent use of drugs to prevent post-operative adhesions may readily be obtained. I have had no experience with eserin, strychnin and belladona being the drugs used.

Small points of irritation, for instance the irritation of an intestinal wall with the point of a needle after a primary increase of peristalsis, is followed by a lessened peristalsis. This must be brought about in a reflex manner, since there is no mechanical limitation of motion. Following this temporary paralysis the adhesion occurs.

It has been shown by several observers that when blood is permitted to flow into the uninjured peritoneal cavity from without it becomes absorbed without the formation of a clot, the endothelial cells of the peritoneum being able to exert the same inhibitive action as the cells lining the blood vessels. If, however, the blood in the free peritoneal cavity is in contact with a raw area of tissue, coagulation over the entire mass takes place.

In my remarks in the discussion of Dr. Campbell's paper last year I called attention to the fact that until the edge of the cut vessel could be prevented from coming in contact with the fluid blood, anastomosis could not be made. The formation of a clot would be the inevitable result. I stated at the time that it was the material beneath the endothelial cells which was responsible for the clot formation. I laid particular stress on the substance immediately below the endothelial cells, for previous experiments had shown that superficial irritation is much more apt to be followed by adhesions than deep ones. By the deep action of the destructive agent the adhesion-forming material is destroyed, while the superficial irritation serves only to liberate the adhesive.

After discovering that ether dissolves the cement

substance from between the alveolar cells of the lungs I sought to prevent adhesions by dissolving out the substance between the endothelial cells. To my chagrin the adhesions took place more readily than before—evidently the ether had dissolved out the substance between the cells, allowing the substance below the cells, which is the actual adhesion-forming substance, to escape.

In order to understand the subsequent steps in the research it is necessary to review hastily the recent advances made in the study of the coagulation of the blood. A blood clot may be said to be formed from fibrinogen by the action of a ferment in the presence of calcium chlorid. The ferment is believed to exist as a pro-ferment, which must be activated in order to become effective. The part the CaCl plays is not definitely known. It has been determined that there are a variety of factors which may prevent the coagulation of the blood. Phosphorus poisoning destroys the fibrinogen and prevents coagulation in this way. Defibrination removes mechanically the fibrin ferment, and hence acts in a similar manner. The addition of a certain amount of peptone or leech extract likewise prevents coagulation. Here, however, the normal amount of fibrinogen is present. The coagulation must, therefore, have been prevented by destruction, in some manner, of the ferment. It has been determined that an antiferment may be produced, and it is quite likely that some such process takes place. Many details have been worked out along this line which can not be recounted here.

Such a brief presentation of the subject will suffice to present the line of proof I wish to offer. The proof of the actual existence of the antiferment may be brought by the production of an anti-antiferment. This is evidently the manner in which the coagulability is restored after it has been destroyed by means of peptone. The attempt to make a clinical application of

the use of the peptone locally for the prevention of adhesions would seem to indicate this.

In carrying out my experiments to determine the relation of blood coagulation to the formation of adhesions, the animal was first brought into a state of incoagulability, after which the peritoneal surfaces were irritated either by sewing together two loops of intestines or by the injection of certain irritants which previous experiments had proven to invariably excite adhesions. The two methods of rendering the blood incoagulable were used, namely, the destruction of the fibrinogen by phosphorus and the neutralization of the ferment by the use of peptone. When a state of incoagulability of the blood in the vessels had been reached before the intestines were united no adhesions occurred. In the case of the destruction of the fibrin ferment the condition could be observed for several days. In the experiments where the peptone is used less time is allowable for observation. Physiologists have determined that after the lapse of a certain period the body reacts against the peptone and the blood becomes again coagulable. The animal is then no longer susceptible to renewed injections of peptone. The failure to recognize this fact caused much confusion in my earlier researches. It was noted that the adhesion process was inhibited for a time, but afterwards it went on again as before. After the above fact became known to me the puzzle was easily explained. This makes it necessary to observe the minuter changes which go to make up the healing process, that is those occurring in the first eight or ten hours.

By observing the formation of the adhesions through the window in the abdomen the failure of the formation of the usual exudate with the coagulation of the same can be observed with the naked eye. This is best observed when two loops of intestine are stitched together and retained in front of the window. Where phosphorus has been used the process may be observed for

several days. During the entire time no formation of adhesion takes place. It has seemed to me that the usual paralysis of bowel was less marked than when adhesions were taking place. If this were true it would be quite remarkable, for the animals are in an abnormal condition and one would rather expect a lessened peristaltic action. The only explanation which would remain in that event would be that the processes of adhesion formation have the power reflexly to inhibit the peristaltic action which permits a more effective union. It would not be any more remarkable than the rectus rigidity in peritoneal inflammations.

The inhibition of the healing process by either of the above methods (phosphorus or peptone) can be fully appreciated only by a minute study of the process in its earlier stages. It is absolutely necessary to have a clear notion of the healing processes in the peritoneum before one is able to interpret the findings in the inhibited condition.

The first steps in the formation of a normal adhesion are the exudation of serum and the change in form of the endothelial cells. The exuded serum coagulates and forms fibrin, particularly at the edge of the healing process. At the same time that the fibrin formation is taking place polynuclear leucocytes escape into the coagulating mass. These leucocytes are exceedingly well defined and are in no way degenerated. Within a few hours round cells collect in the fibrin mass. These cells are as large as the leucocytes, but have a small, perfectly round, intensely staining nucleus. The source of these cells has not been definitely determined. They may be found in large numbers in the subserous and submucous connective tissue in any normal intestine. Certain it is that no such cells are to be found in the circulating blood. At this time the fibers of the basement membrane of the peritoneum begin to loosen and the different fibers become entangled with those of the opposing layer of peritoneum. The fibrin formation

of the beginning appears to remain and serve as a scaffolding for the subsequent processes. A more exact consideration of this problem would involve the question of the formation of fibrous tissue in general, and hence can not be entered into here.

The above brief description indicates all the principles involved in the formation of adhesions. They are completed in from twelve to eighteen hours.

The effect of peptone on the finer changes was chiefly studied. An animal may be "peptonized" by the subcutaneous injection of a solution of peptone and afterwards laparotomized or injected with a few drops of iodin. The most satisfactory way is to open the abdomen and fasten several coils of intestines together with silk. The abdomen is then closed and the animal allowed to have its liberty. Animals representing varying periods of time after this treatment must be studied in order to get a complete picture. In the examinations of sections made from tissues obtained in this way the first striking change is to be noted in the absence of fibrin formation. There being no fibrin, there is no place for the cells to collect, and there are none. It would seem that the primary step in the formation of an adhesion is the formation of fibrin. Until this occurs there seems to be no attraction of cells, no chemotaxis, in other words. It seems that the same thing is true of wounds in other regions. It would seem, therefore, that the initiatory factors in wound healing are the same as those which occur in the formation of a blood clot.

The action of the digestive ferments on the formation of adhesions may be studied in another way, which has a more direct practical interest. Artificial perforations were made in different regions of the intestinal tract by making an incision into the organ and then drawing a fold of the wall at a distance from the incision and tying a firm rubber ligature about it. The original wound is then closed and the abdominal inci-

sion closed. The most convenient region for the performance of this manipulation is in the stomach and cecum. It is intended that after the lapse of a few days the rubber will cut off the wall of the gut and thus form an artificial perforation. The teat of gut-wall projects into the lumen and is constantly bathed in the fluids of the part. In the stomach it is exposed, of course, to the gastric juice. In spite of the many difficulties in the way, it may be determined in the course of many experiments that adhesions about the artificial perforation are much less likely to form at the stomach than at the cecum. I believe this can be explained by the fact that the digestive juices act as an anti-ferment, preventing the formation of adhesions. The pancreatic juice acts in a similar manner. These experiments may indicate from which direction we may expect an explanation of the clinical observation that perforations or wounds in the upper abdomen are of greater gravity than those lower down. It may likewise serve to explain why union of intestinal sutures is so difficult to secure where there has been a wound of the pancreas.

OPERATION FOR UNDESCENDED TESTICLE.

EMERSON M. SUTTON, M.D.

PEORIA, ILL.

The fetal testicle is early directed to its descent by the gubernaculum testis. A band-like process of peritoneum extends from the internal abdominal ring to the organ and thence upward toward the diaphragm. The mesorchium is formed by two folds of peritoneum, one extending above, carrying the vessels, and one below around the gubernaculum testis. The gubernaculum above the testis atrophies, while the lower increases in size as the processus vaginalis peritoneum extends into the inguinal canal and with the gubernaculum extends to the bottom of the scrotum. When the gubernaculum ceases to grow it acts as a cord, drawing the testicle into the scrotum. Should the gubernaculum be defective from failure to develop, or should the upper portion of the band fail to atrophy, it would arrest the testicle in its descent. This was the condition in my patient, a boy, eleven years, cryptorchid, strabismus, nervousness, otherwise well.

Operation.—Inguinal canal incision; testicle found above the internal ring free, cord retained by band extending posteriorly toward median line and upward opposite the second lumbar vertebra. Blunt dissection till cord was free and testicle deposited easily in the bottom of the scrotum without tension. Retaining step of the operation consisted in a button-hole incision through bottom of scrotal sac posterior to its middle, where skin was less elastic; catgut stitches through the edges of the skin and albuginea or testicle in a way

which held the end of the testicle attached to the skin, necessitating healing by granulation.

Results.—Uncomplicated convalescence permitted fixation of testicle in bottom of scrotum, natural size. From a late book on surgical diagnosis I quote the following in regard to retained testicle: "Its chief inconvenience consists in liability of the organ to inflammatory attacks. It sometimes, when complicated with hernia, prevents the wearing of a truss and probably a predisposing cause of malignant disease."

Treatment.—Unless the retained organ gives trouble, it is best to let it alone, no operation for placing it in its proper position having so far proved satisfactory. When it is producing trouble and the other organ is healthy, castration is the proper procedure. Such passing notice of this clinically interesting condition, which is of great concern to parents of cryptorchids, will not satisfy us. Many operations for this affection have been planned, as Kocher's circular stitch, sewing cord in the canal without strangulating it. Watson Cheyne's retaining stitch, through the bottom of the scrotal sac and end of testicle, tied to the under wire of a retaining frame, to be moved after three weeks, when the organ has become fixed in place by adhesion. Objections to attaching the testicle to the bottom of a movable sac are valid, since experience demonstrates the futility of such a method. Katzenstein operation, making a flap from inner side of the thigh, is a step in the right direction. However, with modifications used in this case, considering the satisfactory results, we can fix the testicle absolutely.

ANEURYSM OF SUPERIOR MESENTERIC ARTERY. OPERATION.

Mr. A. G., age 35, married. Family history all good. Patient's past history good. Had typhoid fever, after which had bronchial irritation, fever, chills, gradual loss of weight for past 12 months. Treated for con-

stipation, diarrhea, alternating malaria, tuberculosis. Change of climate without benefit. Present condition bedfast, 2 months slightly elevated temperature, 100-106°; pulse small, 100-120; slight systolic murmur; slight cough; absence of T. B. in spittal; some increase liver dullness; abdomen retracted, tender, with a small tumor which appeared and disappeared so that the patient's claim to feeling a lump was discredited by different physicians who examined him, since the lump was not always palpable. On the advice of Dr. Eisendrath, who examined the patient with Dr. Whitten, an exploratory needle was utilized to clear up the possibility of liver abscess. Result negative. Abdominal incision made and pulsating tumor (the specimen which is here presented to the society) was found. Finding it possible to clamp both afferent and efferent sides of the growth, this was done, which arrested the pulsation, and immediately infraction of the small intestine, extending from seven inches above caput coli to a distance about eighteen inches, took place. The aneurysm was excised and the intestine resected, end-to-end anastomosis, Murphy. Subsequent history was improvement, with proper wound repair. During first two weeks food relished, bowels acting, button retained; *x*-ray located the button lodged at iliocecal valve. Patient able to sit up ten days after operation; complain of pain in caput coli, with intestinal colic; began losing strength at end of third week; tumefaction of right inguinal fossa; reopening lower angle of abdominal incision; formation of fecal fistula. Eight weeks later, having refused second operation for removal of the button on account of extreme weakness, the patient died.

This case caused me to review several other cases which had gone to ground with inexplainable abdominal symptoms, hardly diagnosed after autopsy, to say nothing of the previous guesses. Apoplexy or embolism of the mesenteric arteries deserves our recognition, throm-

bosis likewise, followed, as they are, by sudden or gradual disorganization of the intestine simulating and being diagnosticated as obstruction of the bowels, tuberculosis of peritoneum—in fact, everything within the category.

In the case above reported we concluded the incomplete recovery from typhoid fever was due to endocarditis, with extension of the process to the mesenteric artery, thrombosis leading to aneurysm.

REFERENCES.—Quain, Deaver's Anatomy, Tillman's Lehrbuch Speciellen; MacDonald, Surg. Diag., Cheyne, Buchard.

DISCUSSION.

DR. M. L. HARRIS, Chicago—I am a little surprised that no mention was made of the excellent work of Dr. Bevan on retained testicles, as it has been published a number of times in America in the past four or five years, and also in Germany. Dr. Bevan has devised an operation so eminently successful that it has received not only recognition all over the world, but has become almost universally adopted. With this method he succeeds in replacing and retaining the testicle in a very successful manner.

DR. SUTTON (closing the discussion)—I was aware of Dr. Bevan's method, but this paper was not intended as an exhaustive one. I simply wanted to call attention to the fact that it was possible to retain the testicle by simple rather than complicated methods. Dr. Bevan, as I understand it, lays stress upon freeing the cord so completely that it drops into the bottom of the scrotum without necessitating any retention stitch. But the tendency is for it to retract, in spite of all that, unless there is some form of retention stitch made.

THE PRACTICAL SIGNIFICANCE OF CERTAIN COMMON SYMPTOMS IN THE UPPER ABDOMEN.

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The upper and right hand corner of the abdomen is a field of present-day investigation which promises valuable returns for all efforts made to clear up its symptomatology. It has fallen to the lot of a new candidate for honors in the field of human diagnostic investigation to aid in this beneficent work, viz., the skilled operating surgeon. Surgery to-day, in the hands of the competent surgeon, bids fair to state definitely the reasons for the existence of the symptoms in the upper belly, long recognized by the internist. But neither the internist nor the pathologist, dealing, as they must, with things unseen within the abdomen of the living, have ever been in a position to point out their true pathology. This surgical investigator of living human pathology, it is hoped, will succeed in doing for us in this region what he has been able to do in the lower belly and pelvis. The patients suffering from pathology in the liver and the gall bladder, the right half of the stomach, and the first portion of the duodenum are legion. True, there are other very important originators of pathology in the upper belly, viz., the pancreas and the right kidney; but my subject precludes more than the naming of these organs, because the task that I have set as the subject for this paper is "The Practi-

cal Significance of Certain Common Symptoms in the Upper Abdomen."

The first of these in importance is pain. Pain in the abdomen seldom indicates by its expressed location the point from which it originates. This fact has led some one to remark that the sympathetic nerve has no sense; meaning thereby that the point of pain indicated by the patient may have no reference to the pathologic entity which originates it. Ask the patient to indicate the point of greatest suffering, and in the majority the hand will move in an aimless way over the whole abdominal region. This is true regardless of the grade of severity, except possibly where the peritoneal involvement is slight. When the pain is severe, general muscular rigidity over the abdomen is the rule. When the lesion is only great enough to give a moderate degree of distress, the muscular rigidity is frequently limited to the region above the lesion. This point also is seldom accurately located by the patient. In the average chronic case not having an acute exacerbation, lesions about the gall bladder are less sensitive than those of the stomach. Lesions involving the pyloric third of the stomach and gall bladder can not well be differentiated by external manipulative methods alone. Although pressure applied over the lower costal arch on the right side, as pointed out by Eliot in the *Medical Record* for Feb. 6, 1904, has been found very helpful in about two-thirds of the cases in which the symptoms pointed to inflammation in the region under discussion.

Eliot has shown that costal resistance is likely to be just as marked as is that of the muscles lower down, when covering an inflammatory process. This is especially true in abscess of the gall bladder and cholecystitis. This diagnostic aid has been found useful in my examinations of this class of cases for many years, as it has undoubtedly to others, both physicians and surgeons; but it remained for Eliot to point out and extend its use. I have found it especially helpful in the

pain of the upper abdomen, in which appendicitis was one of the problems in the diagnosis. Pressure over the right lower costal arch, which does not elicit pain, will almost certainly exclude acute gall bladder trouble. It is also interesting to note the difference in costal resistance on the two sides, when the right upper belly is involved in an inflammatory process.

Light finger percussion, which elicits pain, is another valuable method of localizing active inflammatory foci in patients who are not over obese. An ulcer in the stomach or duodenum can often be located in this way, and, when combined with the subjective symptoms present in the case, valuable information is obtained. It might be said, in passing, what has probably been said a great many times. or, if not said, certainly has always been understood by diagnosticians, viz., that a good diagnostician is self-made, and that a no small part of his skill is so subtle as to defy language to express it. The most that can be said is that diagnosis is the use in this day of the facts worked out by many observers, both clinical and laboratory, combined with the results obtained in the examination of many patients of one class. A combination of all these necessary and obtainable conditions will develop in the individual observer an educated instinct for diagnosis, which is invaluable.

Another source of pain is the distension caused by gas. Gas does not accumulate until the inflammatory condition, or its results, are great enough, as pointed out by Graham, to inhibit peristalsis. In this way can be explained one of the causes of the common symptom of distension in the upper belly, which makes the demand for the various anti-dyspeptic remedies. The more serious the localized inflammation the less peristalsis; the less peristalsis the greater the distension and pain which results from it. If this localized condition go far enough to perforate and the patient recover, it is at the expense of the adhesions which main-

tain the local lessened peristalsis; and an acute case is converted into a chronic one.

So far I have referred only to the pain which may result from lesions in the stomach or the duodenum. But the same general symptoms may develop also from inflammatory conditions in the gall bladder, with or without gallstones. It is interesting to note the frequency with which the introduction of food or drink into this corner of the abdomen gives rise to pain, or at least an expression of distress, when any one of the organs in this corner is the subject of disease. Nature tries to keep the parts at rest by refusing to retain in the stomach either food, drink or medicines, and we have been very slow to comprehend the purpose of Nature in this particular.

Another source of pain in the upper abdomen is the contact of the gastric juice with an ulcer in either the stomach or duodenum. This pain is an interesting and characteristic symptom. It is not many years ago that some of us were calling the cases which came complaining of distress in the stomach when it was empty, neuralgia. We learned from our patients that the greatest relief from the pain was obtained by keeping small quantities of food in the stomach. There is probably such a disease entity as gastralgia, which is functional in origin; but we all now believe that in the vast majority of cases it is a symptom, where inflammatory changes is the definite and underlying cause. An ulcer of the stomach or the duodenum, in contact with the acid gastric juice, will undoubtedly account for many of the symptoms of pain in the region of the abdomen under discussion. To quote from Graham, who also discusses contact of food on the ulcer, as follows: "Pain is due almost wholly to the irritant action of the acids on the open ulcer, with the added element of spasm. The greater the quantity of liquid in the stomach and the higher the degree of acidity the more severe the pain. In other words, intensity of pain and degree of

acidity run about parallel. The irritant action of the food as a cause of pain, by passage over the diseased area, can not enter into the question; because anything that diverts, dilutes, neutralizes or removes the acid liquid lessens or entirely relieves pain. Antacids, as a rule, quiet for a time and remove nothing; vomiting or irrigation of the stomach relieves by removing the offending acid; but no rough particles of food which could irritate are found."

Most of those who have written on this subject agree as to the frequency of the pain and formation of gas complained of by patients suffering from lesions in the stomach, duodenum and gall bladder. The next most frequent symptom mentioned is vomiting. Among my own cases, however, nausea is more frequently spoken of than vomiting. Its relation to the injection of food, like that of pain, varies. Pain precedes it in the majority of cases, and it is the suffering from this that undoubtedly brings it on. If the ulcer is in the stomach, and is so located as to be brought early into contact with the acid gastric juice, then the nausea or vomiting will be spoken of as occurring within an hour or two of taking food; sometimes the patient will tell us that the pain comes on at once. This is frequently due to gall-bladder inflammation, and is especially common if there are adhesions about the gall bladder. If the ulcer is duodenal, then four or even six hours may go before the nausea may develop. If the nausea comes on early and is followed by vomiting, the rejected food will be but partially, if at all, digested.

An important determining factor here is the size of the stomach. If this is greatly dilated and, therefore, unable to pass its contents into the small intestine, the patient may suffer for hours; and then by vomiting or by the stomach tube be relieved of a foul, sour-smelling mass of undigested food containing quantities of mucus. Food coming from the stomach in such a state will exclude its ever having reached the small gut. This

should be borne in mind; because, although the undigested mass may be removed four or even six hours after being taken into the stomach, it is evident that the latter organ is physically incapable of putting it into the duodenum. If it had, it would be a pultaceous mass showing digestion; so that the degree of digestion is a clue as to its ever having reached the small bowel.

Another interesting fact, that perhaps may not properly be spoken of as a symptom, is that these patients in the first months or years of their suffering from disease located in these organs, seldom complain of loss of weight. Note, please, that I say in the first months or years. In the beginning, the majority of them are able to maintain their bodily weight, and frequently even to gain; but finally either the impaired nutrition long continued, or the infections which result from the solution of continuity in organs and tissues so richly supplied with lymphatics tells on the bodily weight, and they begin to fail. Recently I had a case (cholecystitis) that had lost thirty pounds in three months, and was still losing when he entered the hospital for operation. When this time comes in the history of one of these chronic sufferers, he always brings with him the suspicion of the probable beginning of a cancerous process, with all that awful word stands for.

Bleeding from ulcer of the stomach or duodenum has not, in my experience, been a prominent symptom except in the cases that have had a long history and are far advanced. Frequently they will tell you that years before they had a sudden and severe hemorrhage, but none since; and that practically they had not seen a well day since it occurred. But this failure, on the part of the patient, to note the occurrence of hemorrhage does not necessarily imply that it has not been present. Where laboratory methods are made a part of the investigation of this class, it has been found that a large percentage have blood in the stools; if in considerable

amount, blood passing in this way may give the stools a meconium-like look, which is spoken of in the text-books as tarry in character. Macroscopically, this same kind of stool can be produced by the infected bile which may be thrown into the bowel from a gall bladder, the subject of cholecystitis. In this latter class of cases the hematin crystals, which are present in the former character of stool containing blood, will not be found, because of the origin of the color-giving substance in the gall bladder. It is interesting to note that the pain and distress which may accompany these cases of cholecystitis will usually lead to a symptomatic diagnosis of ulcer of the duodenum or the stomach. But the internist or surgeon who has seen many cases of ulcer of the stomach and duodenum will not find it necessary, in the great majority, to examine the stools for hematin crystals. Indeed, a careful history well taken will, in the majority, determine the diagnosis so that there need be no question as to the treatment which should be instituted.

These cases usually have periods in which there is an acute or subacute exacerbation of the trouble. At these times there is usually a moderate degree of elevation of the temperature from 100° F. to 101½° F. It rarely rises above this. The temperature curve not infrequently causes one to think of a possible tubercular element in explanation of its persistence. It reaches its maximum in the early afternoon, and gradually disappears toward evening. It differs, however, in that the 6 a. m. temperature is rarely found subnormal, except in the later stages of the condition, when general systemic exhaustion is pronounced. When this times comes, a subnormal temperature is the rule during the entire twenty-four hours. In addition to the temperature, at this time there is a moderate increase in all of the symptoms which have characterized the previous condition of the patient. There is a little more mental and physical depression; a little more localized

distress in the upper right quadrant of the abdomen, especially after taking food, and in consequence of which there is a more pronounced fear of calling on the functions of the stomach, and with it the gall bladder. The patient is willing to drop his usual occupation, and, like a sick animal, seeks a warm and quiet place until the toxemia, which undoubtedly is at the bottom of his symptoms, is thrown off by whatever immunizing resistance he may possess. This is what I am pleased to call the gastric crisis of ulcer or cholecystitis. If resistance is good, the patient may recover his usual degree of health and drift along for weeks, months or years, until another paroxysm of the same kind and due to the same causes renders him inactive for about the same period as the previous attack. These cases are rarely diagnosed correctly, "biliousness" and "dyspepsia" being the words most frequently used as descriptive of the diagnosis, and on which the treatment is based. But there comes a time in the life history of a large number where even a correct diagnosis is futile, as far as preserving the life of the patient is concerned, because of alteration in the functionating tissues of the liver and pancreas, due to persistent infection. I believe, too, that further investigation will show that the results of this infection are chemical through the intervention of bacteria at work in ulcerating areas in the stomach, duodenum or gall bladder.

I have purposely avoided the consideration of other symptoms which you will call to mind as almost invariably present in the condition here discussed. Among these are pain radiating in the region of the right scapula or half way around the waist line on the right side; jaundice; the belching of sour gas; "cramp colic," which is a name descriptive of a condition frequently badly treated by the use of large doses of morphin. These patients are usually obstinately constipated. They often complain bitterly of a bad taste in the mouth and are aware of a foul breath. The abdomen is, as a rule,

distended with gas, showing the lessened peristalsis. They are often more hungry than otherwise; but food gives them neither comfort, satisfaction nor nutrition.

To generalize further: The individuals who may suffer or are suffering from symptoms referable to the upper abdomen range in age from the young adult to those advanced in years. As to previous symptoms, almost anything may be true, and nothing may be true. In the majority, however, two words are used which are descriptive only in a symptomatic way, and from this standpoint have had a long and useful career. I refer to "dyspepsia" and "biliousness," two words which we Americans have probably used as often as any two words in the language. Every patient suffering from a train of persistent symptoms heretofore known as dyspepsia has or has had either a gastric or duodenal ulcer, and is suffering from its sequel. Every patient suffering from recurrent attacks of so-called biliousness has either gallstones or a chronically inflamed gall bladder, which is another name for a chronically infected gall bladder. Unfortunately the class of patients which in one may seem to refer his symptoms to the stomach, in another practically the same symptoms will point to the gall bladder as the organ at fault. Fortunately, in the majority of cases, only one primary affection is present. Unfortunately it is not yet certainly known that the removal of the probable primary affection will permit of recovery from all its consequences. Frequently we find an infected gall bladder (cholecystitis) and with it the stomach is dilated. The primary condition under these circumstances will be difficult to determine, even when the abdomen is open. Such difficulties in diagnosis do not militate against the clinician, as these conditions are purely surgical, and the differentiation in many cases, as well as the proper treatment, must be made on the operating table.

Localized peritonitis and recent adhesions, when the abdomen is open, will serve as infallible guides in the

chronic cases with acute exacerbation; while enlarged lymphatics without adhesions will point the way in the more acute cases. Enlargement of lymphatic glands on the exterior of the body, as a result of infection of nearby tissue, has been noted for an indefinite period. Surgeons, however, were slow in recognizing the lymphatic enlargement found within the abdomen during exploratory operations as due to the same causes, viz., infections. Since the work of Poirier and those associated with him much has been done to advance our knowledge of the special anatomy of the lymphatics. Since their work appeared it has been a much simpler matter to determine the probable location of a lesion, the seat of persistent infection within the opened abdomen. The intra-abdominal lymphatics as carriers of infection open up an immense field for practical investigation as to the possibility of various recognized lesions, especially in the pancreas. Grossly we know what they can do in infections of the appendix, and as disseminators of cancer their work is all prevailing.

The writer has been interested for some years in the question of chronic infections of the liver from persistent gall bladder inflammations, with or without stones; and infections of this same organ as a result of ulcer of the stomach or duodenum. He early learned, in his gall bladder work especially, that a certain small percentage of his cases would die by slow degrees regardless of the favorableness of the primary results following operation; and that a certain other class of non-operative cases will die, with exactly the same symptoms, and when brought to the postmortem table the pathologic findings are the same in both classes of cases. The following cases will, I think, illustrate this fact very well.

May 19, 1899, I operated on Miss C., aged 26, and removed a large number of varying sized so-called mulberry calculi. Previous to her operation she had suffered from the clinical symptoms of gallstones, to-

gether with a chronic cholecystitis. The liver was not enlarged, although notes of the case made at the time distinctly state that the whole liver region was tender to both percussion and pressure made over the costal cartilages. This case was drained and made a good operative recovery as far as the time spent in the hospital was concerned and afterwards while drainage persisted. But she never fully regained her health and finally died, twenty-two months after the operation, with every symptom of internal hemorrhage. Before this developed, however, she had the ordinary symptoms of a mild but persistent cholecystitis. An autopsy was made by Drs. Jesse Rowe and J. C. Creel, both of Abingdon, Illinois. They reported to me the findings as follows: About one quart of fresh clotted blood in the upper abdomen, the source of which was uncertain. A small cauliflower-like growth surrounded the common duct, which was patulous. Several soft stones were found in the gall bladder, which was fastened to the anterior abdominal wall. The inner surface of the gall bladder was inflamed and roughened, and when stretched over the finger looked like the surface of a nutmeg. The bile was thin and tarry in appearance. The liver was not enlarged, but yellow, with a gross appearance of fatty degeneration. Unfortunately no specimens were preserved from either the liver or the growth about the common duct. At the time of the operation there was no appreciable growth about the common duct, and only the usual enlargement of the lymphatics, where sepsis is found in the gall bladder, was present.

My next fatal case came June 20, 1901, Mr. T., aged 77. He also had a history of chronic cholecystitis, with the ill health which it engenders, extending over a period of years. On opening the abdomen, a greatly enlarged gall bladder was found capable of holding nearly a quart of fluid, together with a single stone weighing forty grains, which was loose in the cystic

duct. The fluid which filled the gall bladder was thin, black, degenerated-looking bile, which characterizes this class of cases. This patient's liver was enlarged and tender to both manipulation and percussion. Not to burden you with details of the postoperative history, I will merely say that this patient died in twenty-three days following operation, with a continuation of the symptoms of the same kind of infection which existed previous to his going onto the operating table. At autopsy this liver was found enlarged, and sections prepared for the microscope showed extensive fatty degeneration.

My next case of this class was Mrs. C., aged 61, operated on Oct. 2, 1901. This patient gave a history of severe gallstone attacks extending over a period of twenty-five or thirty years. She had the classical symptoms of stone in the common duct. At the operation I removed a stone from the common duct, the size of a pigeon's egg. Its upper or gall bladder end was faceted in two places, showing the pressure of two additional stones; these were also removed. These two were equal in size to the first. This woman lived fifty days, dying, as the other two patients, in exactly the same way. On autopsy, this liver was found to have undergone the same fatty changes that characterized the liver in the case of Mr. T.

Now, then, bear with me while I partially relate the history of a case that I saw a few weeks ago, Mr. B., aged 54, but looking much older. Marked atheroma of the radial and temporal arteries. Has always been temperate as to the use of alcohol and tobacco. No specific history. Has suffered from chronic irritation of the stomach for twenty years. Gives every symptom of chronic ulcer of the stomach, possibly now malignant. Asks relief because of what he calls his "chronic stomach trouble." Physical examination discloses a stomach with its lower border on a line with the umbilicus. Appendix tender; kidneys negative. The liver

in this patient is very small, evidently markedly cirrhotic. Pressure over the costal arch elicits no pain on either side. This case has not yet been brought to operation; but when he is, what will we find? I believe that it will be both a chronic ulcer of the stomach and a chronic cholecystitis. Further, I believe that the cirrhosis of his liver is the result of long-continued infection from his ulcer in the stomach, or the chronic inflammation of the gall bladder, or both. I believe also that Miss C., above mentioned, would have had the same kind of a cirrhotic liver as is now present in Mr. B. could she have lived long enough, i. e., had a smaller dose of a less virulent infection than she evidently did have, and had not the probable maligant condition found on autopsy intervened. As long as we have ulcer in the stomach or duodenum or an infected gall bladder to furnish a long-continued infection through the lymphatics to the liver and pancreas, we are sure to have occasionally a case which will die following operative procedures in the upper abdomen, regardless of the skill with which such operative procedures are conceived or by whom carried out.

This phase of the question of chronic symptoms in the upper abdomen as indicative of the pathology that may develop there is, I believe, most important, and so far as I know has not been thoroughly worked out, except possibly by Quincke, quoted by Eisendrath, as follows, in the paper mentioned below: "The clinical picture of the cholecystitis usually predominates, so that the cholangitis, with its grave influences on the liver parenchyma, is marked. The course of a cholangitis seems to be most acute with virulent colon bacilli; more chronic with staphylococci and streptococci." These writers (Eisendrath, and Quincke, whom he quotes) make no mention of the possibility that these infections may be the cause of cirrhosis of the liver in an individcal otherwise free from the usual history

that precedes the average case of this disease, viz., chronic alcoholism. Eisendrath's paper, which appeared in the Nov. 30, 1901, number of THE JOURNAL of the American Medical Association, is a valuable contribution to the literature of infections of the liver following acute cholecystitis.

Closely related to the above is the great question of cancer of the stomach. If overlooked, infections can produce such dire results; and, as we are slowly coming to realize that they can, what shall we say of this most terrorizing and hopeless condition of them all? You and I know that at the present day, when the diagnosis is made, the treatment in the great majority is by abandonment of the patient to his fate. We have, as yet, no means of making an early diagnosis, either in cholecystitis, cholangitis or in cancer of the stomach. But we have, as I believe I have pointed out above, symptoms which can be very nearly interpreted aright when it comes to these other conditions which are so common in the upper abdomen. certainly interpreted near enough to know that the only hope of permanent cure is by the aid of surgery. When this time comes, as it surely is coming, cancer will be diagnosed in its earliest stages when the surgical treatment will take into consideration the distribution of the regional lymphatics, which in this situation, as pointed out by Cuneo, are the most favorably situated of any in the body for permitting a radical cure. Thus in curing conditions in the upper belly, which give rise to many distressing and common symptoms, we attain a greater end in the promise of a more permanent relief for our cases of chronic infections of the liver and of gastric cancer. In the realization of this, the internist and the surgeon must join together. If they do not, the records of both in diseases of the liver, stomach, duodenum, gall bladder and pancreas will continue to be a page of regrettable failures.

DISCUSSION.

DR. JOHN B. MURPHY, Chicago—I have nothing special to add to the excellent paper of Dr. Percy, except to compliment him on bringing out with greater force the fact that the differential diagnosis between lesions of the pyloric area of the stomach, the head of the pancreas and the gall bladder is extremely difficult. I was pleased to hear him bring out the point of periodicity of exacerbations in ulcers of the stomach. A large number of patients with ulcers of the stomach have pronounced exacerbations. They are practically well in the interval between the attacks. I recall one case in particular which forced that point on me more than any other preceding it. The case occurred in my practice in the middle part of May of this year. The man was a laborer, who worked regularly between his attacks. These attacks usually did not last any longer than ten days, and they began with a severe colic-like pain, tenderness in the epigastrium, some nausea the first or second day, and incapacitated him for that period, after which he would resume his work as though nothing had happened. He had no lesion of the gall bladder, so far as I could determine, before operation. I was led to believe that the colic-like pain was due to the spasmodic contraction of a tube in its effort in forcing a foreign body through it; but in this case colic was just as pronounced as if he had pyloric obstruction, due, I believe, to the spasm of the pylorus from proximity of the ulcer to it. There was no pyloric obstruction. The ulcer was situated about half an inch from the pylorus; it was large, active and advancing. The portion of the ulcer toward the pylorus was much thicker than the part toward the cardiac end of the stomach, and in the pyloric direction he had repeated advances which brought on repeated attacks. The pronounced feature in this case was the periodicity, the man being practically well between the attacks, notwithstanding the continuation of the ulceration. A posterior gastro-jejunostomy with the button was performed. The jejunum was connected three inches from its origin just at the normal anatomic resting place of the stomach on the jejunum, except the mesocolon intervention was removed. I find the long loop of the jejunum 14 to 18 inches between the origin of

the jejunum and the point of approximation to the stomach was a cause for much of the "vicious circle" symptoms so frequently reported as a sequence of gastro-enterostomy. If the "start loop," three to three and a half inches is used, there is really no "loop" at all; it is just a straight line from the origin of the jejunum to the point of approximation. I now use the oblong button in place of the round one and find it is as easily inserted as the round if one uses the Hartmann button holder. Vicious circle is not much to be feared by this method.

DR. ALEXANDER HUGH FERGUSON, Chicago—This is a very interesting and practical subject, and, like Dr. Murphy, I feel like complimenting Dr. Percy on his excellent paper. There is something practical we can elicit from a study of the character of the pain which occurs in the upper abdomen. Pain coming on suddenly, referred to the epigastric region, but is not necessarily tender, with tenderness over the gall bladder, tends to show that the trouble is within the gall bladder, the stones being engaged in the cystic duct. Should the pain cease suddenly, it will point to the fact that the stone has fallen back; the gall bladder is perhaps distended, and the mucus thrown out has surrounded the stone. Pain occurring while the patient is in a quiescent state—asleep or after he goes to sleep—rather points to the gall bladder than to any other organ. As digestion goes on, the gall bladder begins to empty itself, and the gallstones being very little different in specific gravity from the bile itself, the stone flows towards the cystic and common ducts and the patient has a sudden pain. If the pain be of a lancinating character, and only comes on occasionally in the region of the gall bladder and ducts, beware of carcinoma. Pain, with regard to carcinoma of the gall bladder and bile ducts, and with the stomach for that matter, and carcinoma in other parts of the body, has still to be explained. How can we tell in a case of carcinoma of the stomach, of the breast, or of the gall bladder and ducts, why one case will get such excruciating pain until he or she acquires the habit of taking of morphin to relieve it, while another patient, with apparently the same condition, with the same appearance of carcinoma of the breast, stomach or gall bladder and ducts, has no pain hardly whatever. Pain referred to the back is

more symptomatic of gallstones. We get, however, pain referred to the back on account of a stone or tumor in the kidney. Furthermore, in a tumor of the suprarenal capsule, pain is referred to the back. Then we must not forget Pott's disease, locomotor ataxia. Pain may be referred to the testicle and reflected into the genito-urinary tract, and that would point towards the kidney as the seat of the trouble. I have seen one case of excruciating colic caused by a blood clot in Morison's pouch surrounding the gall bladder, due to a ruptured pregnancy, exactly four weeks to a day from the time of the primary accident. The woman had a most excruciating pain in the region of the gall bladder; whereas, when I saw her, there was no pain in the pelvis nor tumefaction. A clot had formed, hemorrhage had ceased, and the clot was carried up into Morison's pouch.

DR. W. D. HAGGARD, Nashville, Tenn., was asked to participate in the discussion. He said: I appreciate very much your kind invitation to take part in this discussion. The subject is one of such vast importance at this particular time that I think the members of the Association would be profited by a very liberal discussion on the part of the members. When we come to think that nearly all of these troubles occur within an area that can be covered by the palm of the hand; when we think of the symptoms that are so similar in different cases, and that our methods of diagnosis generally end with an exploratory incision, it looks as though we ought to invoke this with a great deal more frequency than we have formerly done. I can not gainsay that expertness and refinement in diagnosis are desiderata; but, at the same time, we must realize that many of these cases are not amenable to the very niceties of diagnosis to which our attention has been drawn. We have to think in a very exact and logical way of the differences in these pains, colics and spells. I was deeply impressed with one point in the paper, and that was with reference to the importance of a well-taken clinical history. If I remember rightly, the essayist stated that a great deal of dependence should be placed on it. And I think that is quite true. We do not always get a typical, classical story of gallstones in these cases. In the case of gastric ulcer reported by Dr. Murphy, for instance, he stated that the patient was

sick for a week or ten days, and that in the interval between attacks he was able to work. This case shows the importance of being extremely careful in differentiation. Then, too, with gallstones in the common duct, it is not uncommon to have patients confined to bed for a week or ten days. There is where cholangitis comes in, plus temperature. These points are of value, and simply accentuate the important facts now obtaining in this area of the abdomen.

Dr. B. B. Davis, Omaha, Neb.—I have been much interested in the paper and discussion. There is one thing I have been struggling against for a number of years, namely: I feared I might get into the habit of making incisions without having studied sufficiently the case beforehand; but I have concluded that a man is more dangerous who will not make an incision until he has made his diagnosis than the one who makes an incision without having an accurate diagnosis made. I run across a case once in a while and try to get as clear a clinical history as possible. I make my examinations in accordance with the best methods known to me, and yet I am not able to reach a very definite diagnosis. I feel that the case may be something that I did not anticipate, and occasionally, even when we do not feel very much perplexed beforehand, we are much surprised. In this connection I will relate briefly a case I had recently. A physician sent me the case, and my own conclusion in regard to it was, after examination, that we simply had a case of cholelithiasis. I expected to cut down on the gall bladder and find some stones, or it might be a simple cholecystitis. However, it seemed more like a case of cholelithiasis. The patient gave a history of several attacks, most of them having been comparatively short, and even jaundice was present in a number of the attacks. There was no tenderness in the region of the appendix; but, much to my surprise, at the operation I found a large appendix turned up underneath the gall bladder, with dense adhesions around the cystic duct—one of the most peculiar conditions I have seen—and it seemed perfectly clear when I saw the peculiar mechanical effect it would have on the duct it was possible to bring about these gall bladder symptoms in the manner that had been done. There were no stones in the gall bladder. It was perfectly patulous. After feeling the adhesions I

could squeeze bile out without trouble. I did nothing to the gall bladder, but removed the appendix, and thus far relief has been complete. I feel in this particular part of the body we can never expect to arrive at that refinement in diagnosis which would seem to be ideal; at the same time I think we should be careful and not get into the habit of making incisions until we have thoroughly exhausted all our resources in arriving at a correct diagnosis.

SPLENIC ANEMIA.

(ABSTRACT.)

PALMER FINDLEY, M.D.

CHICAGO.

The author reported a case of splenic anemia, in which he removed the spleen with good results. The patient was 45 years old, had suffered for four years from a dragging sensation in the left side and uterine hemorrhage. Blood examination showed reds, 2,784,000 per cubic millimeter; leucocytes, 6,000, and hemoglobin, 42 per cent. Thirteen months after operation her blood showed reds, 4,600,000; leucocytes, 6,000, and hemoglobin, 78 per cent., this in spite of the fact that the uterine hemorrhage continued, the patient having refused curettage for its control.

The author offered a word of caution relative to the hasty diagnosis of splenic anemia without giving due consideration to other possible causes for splenic enlargement associated with secondary anemia, such as malaria and syphilis, and advised splenectomy for only the rapidly progressive cases, reserving medical treatment for the milder form.

DISCUSSION.

DR. R. C. COFFEY, Portland, Ore.—The paper read by Dr. Findley throws some light on a case which I have had in my own experience, and in which I was unable to make a satisfactory diagnosis. I made an exploratory incision to determine what the condition was, and found the spleen twice as large as the liver, extending considerably below the umbilicus. I closed

the abdomen, with the expectation of not doing anything. Before this, patient was in an anemic condition, very much like that mentioned by Dr. Findley. A hemorrhage took place apparently near the peritoneum after the operation, so much so that I had to open the abdomen again. I never knew where the hemorrhage came from, and packed around the spleen. I expected the patient to die in a short time, but, instead, recovery ensued, and the patient gained 35 pounds in weight and lived two years afterwards.

HIGH FREQUENCY ELECTRICITY AS A FACTOR IN THE TREATMENT OF SURGICAL AND GYNECOLOGICAL DISEASES.

E. M. SALA, M.D.
ROCK ISLAND, ILL.

It was in December, 1890, that d'Arsonval found that a current of high frequency and high potential could, with impunity, be made to traverse the body; that it even decreased the excitability of the tissues, lowered their arterial tension, and increased the activity of the respiratory combustions.

In 1893 Oudin devised an apparatus which he prefers to call a resonater, which greatly increased the tension of high frequency currents, and called attention to the fact that the local action was accompanied by general reactions.

Tesla, in February, 1891, made use of alternations, with a multiplicity of poles, and by means of transformers raised the potential to tens of thousands of volts, by which means he was able to demonstrate that the high frequency and high potential currents could be passed through one's body with sufficient energy to light up several incandescent lamps, with absolutely no danger to the person.

Static machines may be used for the production of high frequency currents, but to be of any practical value must be of such dimensions as will give a spark of not less than 12 inches long. The velocity of the vibrations, in a high frequency current, is no doubt the reason why there is practically no sensation to the per-

son receiving it. The revolutions of the earth cause us to sail through space at a rate of a trifle over one thousand miles an hour, and yet we are unable to detect any sensation of motion.

A passenger train running at a high rate of speed transmits less motion of the train to a passenger than one running at a lower rate, rolling stock and other conditions being perfect in both instances.

On this hypothesis I think we are able to explain the imperceptability of the high frequency currents. The rapidity also seems to be the reason why there is no danger to human life, and this is in accordance with d'Arsonval's statement, which is that currents of an intensity ten times less would be extremely dangerous if the frequency, instead of being from 500,000 to 1,000,000 per second, was lowered to 100, as takes place in the alternating industrial current. D'Arsonval further admits that the motor and sensory nerves are so organized as to only respond to vibrations of a certain frequency. While there is no excitation experienced on the part of the nervous or muscular system under the influence of the high frequency current, yet it seems that there is some commotion aroused which disturbs the peace and quiet of the bacilli, which may chance to be in line with or effected by the current.

D'Arsonval and Charrin have published some experiments on the sterilizing action of these currents. By immersing a small solenoid of wire of two turns in a U-shaped tube, containing broth and pyogenic bacilli, after half an hour's application, the culture became discolored and absolutely sterile. This has been thought by some English observers to have been due to the molecular shaking that the bacilli have received.

M. Dimitriewski, of the University of Tomski, has been working on various toxins by the effleuve method exclusively, and has found that the toxins lose their toxicity and become innocuous. Quite recently Drs.

Cagriffoul and Denoyes, of the Montpellier Faculty of Medicine, have published a very exhaustive series of experiments on the action of high frequency by auto-conduction on tuberculous guinea-pigs, and have proved that an actual inflammation is produced around the pulmonary foci, and that, finally, this abates and leaves the lung clear of bacilli.

Dr. Chrisholm Williams, of Edinburgh, who has written the first systematic treatise in the English language on the electric currents of high frequency, or, rather, the d'Arsonval currents, reports forty-three cases of pulmonary tuberculosis treated by the d'Arsonval currents, forty of which were treated in London. Out of the forty-three cases three have died; of the rest, thirty-two have had no treatment whatever for over eighteen months. Eight cases had, on an average, two months' treatment each since that time, and at the time the article was written none of them had needed treatment for twelve months. The majority, who were workers, were performing their usual duties. The three deaths were due to pneumonia, tuberculosis, kidney and lardaceous disease. He says that under this treatment they lost their cough and expectoration. The tubercle bacilli disappeared, but in some cases a few could be found months after all treatment had been stopped, yet they seemed in good health. Sometimes their sputum would be without tubercle for months, then a few would reappear for a few weeks and then, without treatment, disappear again. The bodily weight increased in favorable cases as much as a pound a week.

In his opinion, as a valuable adjunct to a sanatorium, it should afford very material assistance, even in the more severe cases that do not usually gain admittance to the open-air camps. If his reports are true, and I have reasons for believing that they are, there must be something in the high frequency current which is injurious to the life or habitation of bacteria.

While pulmonary tuberculosis is not considered a surgical disease, and does not come under the scope of work in this society, yet if the current will cure even a few cases of pulmonary tuberculosis it must necessarily cure other tuberculous affections which are more superficial and consequently more easily exposed to the current, and in this class of cases are included many surgical cases, and it is to be hoped that investigations will soon be carried out in this country more extensively along this line.

Some of the surgical cases which have been treated successfully with high frequency are atonic dilatation of the stomach, lupus vulgaris, lupus erythematosus, sciatica, hemorrhoids, fissure of anus, prolapse of rectum, simple ulcer, rodent ulcer, malignant growths, etc.

Williams reports one very interesting case of dilatation of the stomach, which was subjected to high frequency treatment for six weeks. The stomach gradually receded and reached its normal size, and there was no recurrence after one year had elapsed.

Drs. Alexander Crombie and T. J. Bokenham report seventeen cases. They were cases of non-obstructive dilatations. After a number of applications, varying in different cases from ten to twenty, the stomach was found to have assumed its normal position and size, and the other parts of the intestinal tract to have returned to their natural relative positions. At the same time, in all but two patients, the normal process of digestion was restored, but it was considered advisable to continue the dietary régime for some time longer. There was a slight relapse of indigestion in one case and of dilatation in another after dietetic indiscretions. In one there was no improvement in digestion, owing apparently to a radical fault in the gastric juices (hypochlorhydria), although the stomach remained of normal size. Their opinion is that the walls of the stomach are toned up by the action of the current on

the unstriped fibers by its effect on the vagus. They have demonstrated that the stomach has receded from one-fourth to three-fourths of an inch in all directions immediately after the treatment. Lupus vulgarus and erythematosus have yielded very readily to the d'Arsonval current, and Williams reports one cure of lupus erythematosus after seven months' failure with the Finsen light, besides many years' treatment with ointments, lotions, caustics and frequent scarifications.

While sciatica may not be, strictly speaking, a surgical disease, yet I believe when it is treated by means of osmic acid injections or by stretching we are using surgical procedures, and it should be classed as a surgical disease.

In this year's May number of the *Illinois State Medical Journal* there is a very interesting article by Prof. W. T. Somerville, of Glasgow, Scotland, Fellow of the Faculty of Physicians and Surgeons, Glasgow, and member of the British Electro-Therapeutic Society, on High-Frequency Currents.

He reports several cases of sciatica, the first of which I wish to relate in full. "In November, 1902, I was consulted by a farmer, weighing over 250 pounds, who had been troubled with sciatica of the right lower limb for six months. The pain was constant, and he was unable to lie, still less to turn in bed, without suffering. Before treating a case of sciatica it is important to satisfy one's self that the pain is due to neuralgia of the nerve itself, and not to a perineuritis, where, in addition to an affected nerve, adhesions of the nerve sheath have formed. In such cases the pain is chiefly or only felt on movement of the limbs, due to the dragging of the adhesions on the nerve. When such a condition is present neither high frequency or any other form of electrical current will cure the patient. The nerve has to be stretched and the adhesions separated. Recognizing that in the case now referred to, I had to deal simply with a neuralgia, I applied the high fre-

quency currents, and after eight visits the patient was cured. I was able to flex the thigh on the abdomen without pain, and the man himself could adopt all attitudes capable of putting the nerve on the stretch without discomfort; in short, from being a comparative cripple he was dismissed in a condition quite fit for his work as a farmer. I saw this patient on March 1, 1904, fifteen months after treatment, when he told me that he had had no pain since he had been treated, although he had been exposed to hard work and all kinds of weather." He reports several other cases of sciatica treated with equal results, also hemorrhoids, varix of leg, lupus erythematosus, peripheral neuritis, fissure of the anus, besides many other medical diseases.

Williams reports good results in neuralgia (mostly facial), hemorrhoids, warts, fissure of anus, prolapse of rectum, simple or callous ulcers, rodent ulcers, etc., and I will briefly narrate the following case of his. It was a case of rodent ulcer, which had returned after operation, nine months previously. He used his thumb as an electrode, the patient being on the auto-condensation couch, and connected to one pole; the other was connected to the operator, and the circuit completed by his thumb on the ulcer. At the end of the first three applications the dry serum, etc., became attached to his thumb, and he could feel it getting loose after a few minutes, owing to the serious exudation from the deeper parts. Each application seemed to shrink the ulcer up. The hard edges were most resistent, but soon healed, and there was no return at eleven months following disappearance, and there was no treatment used during that period. Williams also reports three cases treated by Dr. James Allan, of Chislehurst. One was a case of sarcoma of antrum; no recurrence in three years. One was mammary carcinoma, with slight signs of recurrence one year after, which was removed with no

further trouble following; this, too, after very gloomy prognosis had been given.

The third was a case of scirrhus left breast, which had returned two months after excision of breast. High frequency treatment was begun Nov. 2, 1901, unipolar applications 15 minutes each, using a primary energy of 3½ amperes. After the fourth application the pain began to subside and the hard indurated parts to soften. The patient's general condition improved rapidly, sleep returned, and the appetite was described by the patient herself as ravenous. After twenty-eight applications all trace of the recurrence had disappeared, but the patient insisted on continuing the treatment, as she felt so much better for it. She had, in all, forty-eight sittings, and there was no recurrence up to March 27, 1903. A case of epithelioma of the uterus was also included in Dr. Allan's list, which seemed to show marked improvement, but contracted pneumonia and died before treatment was completed.

Fruend says that spark discharges from d'Arsonval's Oudin apparatus act in the same way on bacteria as direct polar discharges from the coil, but that the intensity of action of the latter is greater. He also says that, even by interposing a piece of human skin, living bacteria can be absolutely prevented from developing by treating them with negative polar discharges of high tension induced currents. He also says as regards the utility of these in medicine there can be no doubt that they are successful in dealing with certain affections where other methods have failed.

Fruend also says that Bisserie, whose authority is beyond question, in a notable work,[1] reports the treatment of 62 cases of lupus erythematosus, 33 of which were completely and permanently cured, and Jaquot, too, cured 39 cases out of 56 with the current.

My own personal experience with d'Arsonval high frequency currents has been of short duration, but,

1. Journ. de Medicine et de Chirurgie pratique, Feb. 25, 1901.

since the current is only a little over one year and a half old in this country, no one here can have had a great amount of experience. "In America the current is almost unknown except by name, its true nature and the method of its production having been overlooked by the authors of American text-books on electro-therapeutics, although other high frequency currents (not d'Arsonval) have received some slight attention, and still other currents of a totally different nature and masquerading under this name."

My first case was a middle-aged lady who had been treating for one year with several physicians for the relief of pain and partial ankylosis of lower jaw bone; pain extending over right side of face and neck. Patient was unable to separate her teeth more than one-quarter of an inch, and there was a small hardened neoplasm in the right masseter muscle about the size of a small hickory nut. She had been advised to submit to an operation for the relief of her trouble, but, being unnecessarily alarmed about operations, she was drifting around looking for relief without operation. I advised her to have the high frequency current applied for a few times, and see if it relieved her. I used in her case an ordinary glass-vacuum electrode applied to the entire right side of face and neck, most of the time over the space occupied by the masseter muscle. The current was applied for ten minutes on seven successive days, when she was compelled to return to her home. Three weeks after the last treatment I received the following letter from her, which was unsolicited:

"*Dear Doctor*:—I am so pleased to tell you that I have improved so much since I came home; I can open my mouth to full extent and I can swallow without any trouble. There is some pain in the back of my neck and through the lower jaw bone. I can chew and swallow meat, and that is something I have not been able to do for six months. I advocate great faith in those

treatments, and I intend to take some more as soon as I can see my way through. Yours with respect,

"MRS. T."

The last time I heard from her, which was six months later, she was still all right, with no sign of a recurrence, and she had only the original seven treatments.

Case No. 2 was a boy with large black warts on both hands, six on one and eight on the other. Six treatments, lasting from three-quarters to one minute on each wart, succeeded in freeing both hands.

Case No. 3 was a girl, aged 18 years, who had a suppurating sinus, following extraction of a diseased tooth, sinus extending from angle of left lower jaw out through the cheek. Sinus was first opened up wide, bone scraped, packed with gauze, repacked many times, and other ordinary treatment employed, and still sinus continued to discharge. She was then treated with the high frequency current, by means of local application, using glass vacuum electrode, and the sinus closed up after the fourteenth treatment, and has remained closed, now three months, with no sign of recurrence.

Next was a case of exophthalmic goiter in girl, aged 22 years. She was given ten treatments, using vacuum electrode without any apparent improvement. She was then treated by vibratory massage, with a disappearance after twenty treatments, lasting fifteen minutes each.

Next was a girl with acute arthritis of left ankle joint, with one-half inch swelling circling the ankle, and intense pain. After six treatments pain and swelling disappeared, and there has been no recurrence in six months.

Next was a lady, age 38 years, with large black mole on left cheek, one-fourth inch in diameter, present since birth. Three weeks previous to treatment mole and surrounding tissue had become much inflamed and

indurated. She was given eight treatments with glass vacuum electrode. After the fifth treatment inflammation had all disappeared, and after the eighth the mole had also disappeared, and there has been no sign of a return, now three months since last treatment.

Next was a lady, age 36 years, with pelvic inflammation and dysmenorrhea, pain almost unbearable. After six treatments, using glass vaginal electrode, symptoms disappeared, and have not recurred, now four months.

Next were two cases of ulcer of cervix, which refused to yield to high frequency. One was an ulcer of 20 years' duration. I believe, however, if the electrodes were made so that they would be non-conducting down to within half an inch of the terminal end that the current would cure these cases very readily.

Next was a girl, aged 19 years, with acute salpingitis of uncertain origin, also contiguous inflammation. She was given eleven treatments, and symptoms cleared up beautifully. Her uterus was bound down by adhesions and retroverted. So subsequently I opened the abdomen to suspend the uterus and break up the adhesions, but, finding both tubes occluded beyond repair and club-shaped, I did a double salpingectomy and fixed uterus to abdomen. There has been no trouble since, now four months.

Next was a case of chronic orchitis of left testicle. Testicle was about two-thirds the size of a cocoanut. The current was applied fifteen times, and testicle reduced one-half in size, but it refused to go any further. The right testicle became slightly affected, so it was thought best to remove the left in order to save the right. This was done, and result good.

Next was a man, aged 33 years, with lupoid ulcer on the inner side and sole of the right foot, three inches in diameter. The ulcer showed signs of improvement after the second application. Current was applied every second day by means of glass vacuum electrode,

and the ulcer was entirely healed up after the sixth application.

In addition to the preceding, I have treated many cases of pain and neuralgia in different parts of the body, and it seems to relieve and cure the pains from most forms of neuralgia immediately. It is a slight local anesthetic, when applied by the effleuve method, and is painless when applied to the surface, but, held a slight distance away, there is a burning pain experienced at first, which soon subsides when the part treated becomes anesthetized.

Williams reports many additional very interesting medical cases treated successfully by means of the d'Arsonval current.

While sufficient time has not elapsed to say what the permanent results are going to be in these cases, yet I am convinced that the d'Arsonval-Oudin apparatus has a very promising future. Possibly there have been some claims made for it that can not be substantiated in all instances, and yet, on the other hand, it has been demonstrated that it has been effectual in a number of diseases that previously we have had difficulty in conquering, and I firmly believe that there are many other diseases that we will be able to cure easier than by any other method.

THE TREATMENT OF BONE CAVITIES.

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Every surgeon knows how necessary it is to secure apposition of the soft tissues in order that perfect union may follow. He also knows that by the judicious use of buried absorbable sutures and pressure he can avoid the dangers of dead space. There are some wounds where soft and bony tissues are both involved; for example, in excision of the elbow, in which it is impossible to avoid dead space, because it is necessary to keep the cut bone ends separated to prevent bony union, and in which it is not practical to fill the gap with the soft tissues. Under perfect conditions Schede's method of allowing the space to fill with blood clot will yield favorable results, but, unfortunately, perfect conditions seldom obtain. This blood clot is the very thing we are trying to avoid when we try to obliterate dead space, because it is such a good culture medium and is so liable to end in suppuration. Although the intelligent use of the blood clot is of very great value, it is open to so many objections that we are constantly trying to avoid it by obliterating dead space. That we should ever deliberately use it is a surgical paradox.

The surgeon experiences even greater difficulty in overcoming bony defects, because nature seems to be less helpful in dealing with bony tissues. Schede's method has also been employed in filling cavities in bone, but it is open to the same objections here as in the soft parts—with one exception—and when it does

succeed shrinks so that the end results are not eminently satisfactory. The exception is that in bony tissues the size of the blood clot can be better controlled.

Newber's method of turning the periosteum and integumentary flap into the bone cavity and fastening it there is only applicable to very superficial bones like the tibia, and leaves very unsightly scars.

The modern surgical belief is that a local tuberculosis should be treated by removing it just as if it were a malignant growth, because untreated it has a natural tendency to spread and because the removal is so successful. Having removed a focus of this kind from bone, a very common method of treatment is to pack the wound with iodoform gauze and to keep repacking it until it is healed from the bottom. This is a tedious and at first a painful process, and not infrequently there is a recurrence of the disease in the sinus in spite of every precaution. A bony cavity made for the removal of a tuberculous focus where there is no mixed infection is an ideal one to fill with some artificial material which will permit the complete closure of the wound.

The modern operation of necrotomy for the removal of a sequestrum following osteomyelitis is a very safe and satisfactory one. The dangers from sepsis are removed by our present methods of wound treatment, and the danger from hemorrhage, which was at one time a grave one, is now completely overcome by the use of the Esmarch bandage. Another very great advantage of this bandage is that when it is applied we can use the strongest disinfectants without fear of poisoning from absorption. It is very important that it be always used in operations on chronically inflamed bones, because without it the hemorrhage is always troublesome and ofttimes dangerous. Having removed the dangers from this operation, the only drawback is

the very slow healing of the open wound. When we can fill this cavity with some material that will admit of the immediate closure of the wound, thus doing away with the protracted convalescence, we shall have attained surgical perfection.

Chronic bone abscess without necrosis is also a very favorable condition for the use of an artificial bone plug, because the cavity is easily sterilized and the immediate closure of the wound saves the patient weeks, and sometimes months, of time and much suffering.

Dentists have for a long time excited our admiration by the skill with which they fill cavities in teeth with artificial filling, but they admit that they have not yet found a perfect filling material. Surgeons have faithfully applied dentists' methods and materials to the filling of bone cavities, but have failed because the materials act as foreign bodies on the soft parts and cause trouble. Plaster, cement and copper amalgam have been tried and found unsatisfactory. The last notable effort made in this direction was by Senn, who advocated the use of decalcified bone chips. These chips were dusted with iodoform, packed into the cavity and the wound closed. The interspace between the chips necessarily became filled with blood clot. While meeting with a measure of success, the failures were so numerous as to prevent this material from coming into general use.

In January, 1903, Von Mosetig reported a large number of successful results from the use of a new bone plug. In my original title I spoke of this material as Moorhof's bone plug, because my knowledge of it came from his extensive and successful use of it in his clinic at Vienna.

This material consists of sixty parts iodoform, forty parts spermaceti and forty parts of oleum sesami. These ingredients are slowly heated to 100 C. and when allowed to cool form a soft solid which remains solid at the temperature of the body. For use it is heated

to 50 C., being constantly stirred to keep the iodoform evenly distributed. At this temperature it can be poured into the cavity where it immediately solidifies. This material does not act as a foreign body, nor does it act as a culture medium. It possesses the inhibitory and medicinal properties of iodoform without causing iodoform intoxication. Its physical properties are such that it is gradually absorbed and replaced by granulations, and finally by new bone. Moorhof shows many skiagraphs illustrating this process.

In using this material the most important part of the technic is the preparation of the cavity. It must be dry and sterile. When the cavity is largely surrounded by soft parts it is impossible to prevent some oozing into it, and it is advisable to provide for some temporary drainage, preferably by a few strands of catgut which will absorb and thus avoid the necessity for an early change of dressings. In tubercular cavities where there is no mixed infection, and in chronic bone abscess where the cavity is practically sterile, success is almost certain, but in tubercular cavities with mixed infection and in those made for necrotomy it requires the utmost care to secure asepsis. The soft parts and the periosteum should be retracted and the bony covering sufficiently removed to admit of free access to the cavity. All diseased or necrotic tissue must be removed and the cavity dried and disinfected. The drying can usually be done by means of gauze. An adrenalin solution has been used where oozing is persistent. One to five hundred bichlorid or a 12 per cent. solution of chlorid of zinc have been used for disinfecting the cavity, but I prefer the 95 per cent. carbolic followed by alcohol. With the Esmarch bandage applied and the cavity thoroughly dried, the cavity can be filled with the acid, which may be left for several minutes with impunity. Moorhof uses an electric hot air blast in his clinic which both dries and disinfects the

cavity. A Paquelin can be used, but is not so convenient.

The cavity having been prepared, it is poured full of the melted material. The periosteum is closed with catgut and the integument with fine silk, after which a copious surgical dressing is applied and the part is put at rest.

This treatment can not be used in acute osteomyelitis, because the cavity can not be sterilized.

My experience with this material, although limited, is sufficient to satisfy me that better results can be obtained in these cases through its use than by any older method.

As an illustration I will briefly report four recent cases.

Case 1.—W. B., of Minneapolis, a boy, aged 6 years, with a badly united fracture of the inner condyle of the humerus. Both extension and flexion were greatly limited by bony impact. Aug. 16, 1904, at the Northwestern Hospital, Minneapolis, arthrotomy was performed. The condyle was found rotated on its transverse axis and united in such a manner as to make improvement impossible without an operation. It was impossible to separate the fragment and restore it to its normal position without endangering its circulation, so the projecting points were shaved off with a cartilage knife until the joint could be flexed and extended to the normal limits. After careful hemostasis the cavity was filled with the paste, the wound closed without drainage and the arm put up in a plaster-of-Paris bandage in full extension. In two weeks the dressings were removed and the wound found to be perfectly healed. A plaster splint was then applied, with the arm flexed to a right angle. At the end of about five weeks all dressings were removed, passive motion employed and the boy encouraged to use the arm.

The arm at the present time is very much improved, although somewhat restricted in both flexion and extension. I am satisfied that the presence of the paste, by keeping the raw surfaces apart, enabled me to secure a much better result than I otherwise would.

CASE 2.—Rose W., of Loretta, Minn., 19 years of age, with a well-marked tuberculosis of the elbow and failing health. Operation at the Northwestern Hospital Aug. 19, 1904. Through a straight posterior incision a complete excision of the joint was made, all of the synovial membrane and the ends of all three bones being removed, leaving quite a large cavity, but no trace of disease. After most careful hemostasis the cavity was completely filled with the bone plug and the wound closed without drainage. Over a copious dressing a plaster bandage was applied, with the arm in full extension. Very little pain or reaction followed, and at the end of two weeks the dressings were changed and the stitches removed. The wound was healed, with the exception of one small point, where some blood serum was escaping. A copious surgical dressing and plaster splint were applied, with the arm in extension as before. After three weeks the dressing was removed and the wound found perfectly healed. The arm was then flexed and a plaster splint applied. Two months after the operation all dressings were removed and the patient advised to begin careful use of the arm. On December 17, four months after the operation, the patient reported for examination. She has gained over twenty pounds in weight and has the most perfect result I have ever seen after a complete excision of the elbow. With the patient standing and the arms hanging, there is no perceptible difference between them. She has complete extension and supination. She can pronate freely, can readily grasp her nose and can even do up her back hair with the operated arm. No trace of the bone plug can be felt. The bone plug, by filling the dead space and keeping the bones well apart, gives

nature a chance to form a new joint; at the same time by its gradual absorption it allows the bones to approximate so as to prevent a flail joint. The lateral motion in this joint is only perceptible when one takes hold of the arm and bends it sidewise. It is evident from my experience in this case that when the soft parts are extensively involved it would be better to provide for temporary drainage of blood serum.

CASE 3.—Mrs. M. R., of St. Paul, aged 49. Early in 1904, at a St. Paul hospital, this patient had the ninth rib removed from her left side for tuberculosis. The wound was packed with iodoform gauze and was about six months in healing. When she came to me in September there was an extensive tubercular infection of the fascia in the epigastric region and of the ninth costal cartilage on the right side. On Sept. 9, 1904, at the Northwestern Hospital, I lifted an extensive flap from the epigastric region and dissected out the diseased tissue. The wound was closed without drainage. An incision was then made over the tender swelling along the rib and cartilage. The whole cartilage of the ninth rib was found loose in a bed of tubercular granulations. The cartilage was removed, the granulations curetted away and the cavity filled with 95 per cent. carbolic acid. This was followed by alcohol and the cavity thoroughly dried. The cavity was then poured full of the melted bone plug and the wound closed without drainage. The stitches were removed on the eighth day. Union was perfect throughout, although there was considerable effusion of serum under the larger skin flap in the epigastrium. This all disappeared without leakage, and in two weeks the patient went home, free from pain and temperature. Two months after the operation there was no depression at the point where the cartilage had been removed, showing that the gradual absorption of the plug had enabled nature to fill in the space without deformity. This case demonstrates the advantage of filling a cavity with

the bone plug over the open method with gauze packing.

CASE 4.—Sam S., of Iron River, Wis., aged 28. The patient was suffering from hypertrophic osteoarthritis of the left hip. On November 20, at the Northwestern Hospital, I removed the roughened hypertrophied head of the femur through an anterior opening. Hemorrhage from the bone was very severe, which required temporary packing and hot water to check. It was impossible to check it entirely so as to allow me to fill the cavity with the bone plug at once, as I had hoped to do. The cavity was packed with iodoform gauze, which was left for two weeks. Notwithstanding the fact that I had repeatedly tested, with my hand, the temperature of the water used to check the hemorrhage, it was so hot that it caused necrosis of the subcutaneous fat and quite a slough around the wound. However, by careful cleansing and free use of 95 per cent. carbolic I was enabled to pour in the bone plug when the packing was removed after two weeks. The patient has been practically free from temperature and pain since the introduction of the plug and is rapidly convalescing. He certainly has been more comfortable and is making a more rapid recovery than he would under any other treatment with which I am familiar. It is extremely doubtful if an infection of the joint could have been avoided in any other way in the case.

DISCUSSION.

DR. ARTHUR T. MANN, Minnneapolis, Minn.—Last winter I had the pleasure of seeing Moorhof use his bone plug and saw some of the interesting work that is being done by him.

The first case I saw in which the bone plug was used was one of tuberculosis of the tarsal bones of the foot, with a discharging sinus on the side. Dr. Moorhof made an incision across the full front of the ankle joint, caught the tendons with sutures, which were to be tied later, cut all tendons and then turned the foot down. He removed the astragalus, a third of the os

calcis, and curetted out some of the tuberculous tissue; he cut out the skin and tissue about the sinus, put the foot in place, drew his sutures in the tendons tight, and filled the cavity with this bone plug. He said he expected to get union by first intention and that the plug would fill in with bone.

He showed a series of skiagraphs taken of a similar case a number of months before. The skiagraphs were taken at intervals of about two weeks. At the end of two weeks the bone plug stood out as prominently as a piece of lead in the ankle; at the end of two weeks more it began to be a little indistinct and slightly irregular in its outline; two weeks later the irregular indentations were a little more marked, new tissues were growing in to take its place; and so on up to the eighteenth week, when there was no more trace of it than if one took a pencil, let it fall on the paper, drew it lightly along for a short distance and ended with one more dot. This patient was walking on a movable ankle, with one-half an inch shortening three months after the operation. These are wonderful results. They preserve a useful foot in just the cases in which we have heretofore performed amputation.

Another case was a girl, 13 years of age, with tuberculosis of the carpal bones, in which there was also a discharging sinus. He removed all the carpal bones, except the pisoform, to which the flexor tendon is attached, leaving this because he would get a better movable wrist. He did not have to cut the tendons, but separated them, made the cavity clean, and then made the cavity dry by means of a hot-air apparatus, blowing air into the cavity to dry it. He used the bone plug in this case, and got union by first intention.

He showed a similar case on which he had operated three months previously. The girl was now sewing with that hand. He dressed sixteen cases one morning, and of this number there was but one unimportant stitch abscess.

In the use of this bone plug we have made a remarkable advance in bone surgery.

DR. MOORE (closing the discussion)—I have very little to add, except to remark that the cases just cited by Dr. Mann as having occurred in the practice of Moorhof demonstrate the great possibilities of the bone plug in the treatment of cases of tuberculosis of the

wrist and of the ankle joint. We have feared those cases so much, because of the marked tendency to recurrence and to involvement of the lungs. When an adult patient comes to me with a well-marked tuberculosis of the ankle, I advise him to have an amputation performed. I have done this for a number of years, but I believe now I should treat such a case by the method I have described. With a younger person, with well-marked tuberculosis of the wrist, if it were my child, in years gone by I would have said that death would follow from pulmonary tuberculosis sooner or later, but I am in hopes now that cases can be saved by this treatment.

EXTIRPATION OF THE GASSERIAN GANGLION IN THE TREATMENT OF FACIAL NEURALGIA,

WITH A REPORT OF SEVEN CASES.

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CHICAGO.

During the last decade the treatment of inveterate facial neuralgia has progressed mostly along surgical lines. The remedies employed in the medical treatment are about the same as before the disease came within the domain of the surgeon. The hypodermic injection of large and increasing doses of strychnin and the internal administration of castor oil are still largely relied on by the internalists. In a certain percentage of the milder cases and in a few of the more advanced these remedies will give relief. Their value, however, is uncertain in any case and the relief afforded but temporary. In the less severe surgical procedures, viz., neurotomy, neurectomy and avulsion of the peripheral branches of the fifth nerve, little, if any, advance in the technic can be recorded. The status of these operations remains as before, limiting their application to cases where medical treatment has failed and where the disease involves only one or at most two of the nerve divisions. Even in these we can not insure the patient more than a short period of relief, varying

from a few weeks to at most a few months. In a few the disease is self-limited, recoveries having been recorded even in the most severe types after years of suffering. The hope of securing anything but temporary relief from the peripheral operations is but slight if we accept Thiersch's statement that if less than 5 cm. is removed rapid regeneration of the nerve quickly follows with return of the pain. That even a much larger defect may be completely and quickly restored is evidenced by the case reported by Garré, where, after resection of the entire mandibular division of the fifth by Madelung, function was completely restored with return of the pain in eight months.

The injection of osmic acid into the peripheral branches of the nerve, either directly through the overlying tissue or after exposing the nerve by incision, first proposed and practiced by Neuber and lately revived and extolled by Murphy, has its physiologic counterpart in neurotomy. Probably regeneration is somewhat longer delayed after its use than after simple section of the nerve, owing to its property of hardening nerve tissue; but in the end regeneration with return of function undoubtedly occurs. In the cases reported by Murphy sufficient time has not elapsed to permit any opinion as to the permanency of the cures.

In cases where the peripheral operations have been tried and where medical treatment has failed to benefit, we are fully justified in giving the opportunity of securing permanent relief by removal of the Gasserian ganglion. In other cases where from the first the disease has been of the most severe type, particularly if all three divisions are involved, we can with propriety suggest removal of the ganglion as a primary operation. The magnitude of this operation is such that we believe it should only be attempted where there is no other hope of securing relief from what is probably the most terrible disease that afflicts mankind.

In further justification of this operation the pathology of trifacial neuralgia seems to point to the ganglion as the seat of the disease. Sanger of Hamburg, one of the earliest investigators in this line, found in the ganglia removed by Krause marked changes of a degenerative character. In the first ganglion examined he found the ganglion cells reduced in number, shrunken and irregular in shape, with the nuclei indistinct or absent. There was also an increase in the interstitial connective tissue. In the second practically the same changes with pigmentation of the remaining ganglion cells was found. Conditions similar to these have been found by Horsley, Putnam, Rose and D'Antona. Podrasky, Lavaran, Allen and Romberg found chiefly a condition of sclerosis of the ganglion.

Schwab collected twenty cases from literature in which the ganglion was examined after removal and reports on two examined by himself. In one of these the peripheral branches had been resected ten years before. In the latter most marked changes had taken place. In the others nothing pointing to a definite permanent change for the normal could be found. Unequal staining of the cells with slight irregularities in shape and atrophy were the most significant findings. He concludes that trifacial neuralgia has probably no definite anatomic characteristics, and that it is a neuritis beginning in the terminal branches of the nerve with a tendency to ascend, and ending in a chronic interstitial inflammation of the ganglion. He believes, however, that wherever the disease process is located relief must come from removal of the ganglion.

Keen and Spiller described changes found in six of their seven cases which they consider conclusive in character. In the ganglion the medullary sheaths and axis cylinders were much swollen and the fibers atrophied. Most of the sheaths were empty. In some

the nerve elements had been destroyed, the axis cylinders being replaced by connective tissue. The ganglion cells were atrophied, pigmented and stained faintly. The blood vessels were narrowed, in some the lumen being completely obliterated. Barker has found variation in the shape and size of the ganglion cells with fragmentation and pigmentation. Coenen examined the ganglion in fifteen cases which had been reported by Lexer. He lays stress on the importance of distinguishing between the findings in cases where previous peripheral operations have been performed and those where extirpation of the ganglion was the primary operation. In the former the changes found in the ganglion are probably the result of degeneration following section of the nerve trunk and are analogous to those found in the spinal ganglia in amputation of an extremity. In cases where no peripheral operation had been performed he found nothing that would justify the assumption that the disease process was confined to the ganglion. In the cases previously operated on the changes found were principally swelling of some of the ganglion cells with vacuolization, atrophy and pigmentation. Other investigators have detected changes in the nerve trunks in cases of long-standing neuralgia. Duplay found in one case numerous small neuromata along the nerve trunks. These he considers to be sufficient to cause the neuralgia. Wagner, Carnochan and Allen saw evidences of the inflammatory condition of the neurilemma. In Krause's cases, examination of the nerve trunks removed with the ganglia did not show any pathologic change.

Although at the present time it is impossible to state positively that the changes found in the ganglion explain the origin of neuralgia, still it is of no great moment whether the cause of the pain exists in the peripheral nerve or in the ganglion. The essential feature of the cure is to separate completely the cerebral sensory center from the paths of distribution of

sensation. This can only be accomplished either by dividing the sensory root or by the removal of the ganglion.

In proposing the removal of the ganglion for the relief of a disease that never proves fatal, we are often deterred by the great risks of the operation and the high mortality that still follows its removal. Unfortunately late reports do not show any great improvement in this respect. The earlier statistics show fully as good, and in some cases better, results than the later. This undoubtedly is due to the fact that more unsuccessful cases are reported as the operation becomes better recognized and more generally accepted by the profession. Marchant and Herbert, in 1897, collected 95 cases, of which 66 were operated on by the temporal route, with a mortality of 12 per cent. In all of these cases the ganglion was not extirpated, so that the figures are not of much value. Tiffany collected 108 cases, with a mortality of 22 per cent. Carson's 100 cases, none included in Tiffany's collection, show 11 per cent. mortality. In Murphy's collection of 142 cases, published in 1902, 100 of Carson's and 42 collected by himself, the mortality was 15 per cent. However, in his own personal cases, 12 in number, he had four deaths, a mortality of 33 1-3 per cent.

The removal of the Gasserian ganglion is always a most difficult procedure, and in the hands of the most skillful fraught with great danger to the patient. A record of each operator's successes and failures, with a critical discussion of the methods employed, will serve to more definitely determine the status of this most difficult and, when followed by success, most gratifying operation.

Since 1896 we have operated on seven cases. In all we believe the ganglion was completely removed. Of these seven cases, the first was reported by us in the *Chicago Medical Recorder* in 1897. This case, with the following two, were included in Carson's collection.

The fourth, fifth and sixth were included in Murphy's collection. The last is here reported for the first time.

CASE 1.—Mrs. S., widow, aged 67. Nativity, German. Referred to me by Dr. W. L. Baum, of Chicago.

Family History.—Negative; both parents lived to be over 70 years of age.

Past Illness.—Had typhoid fever twenty years ago; had severe attack of malaria fifteen years ago.

Present illness began suddenly ten years ago, with sharp, stinging pain in the left side of the face. The first attack came on while washing the face in cold water, the pain being limited to the left infraorbital region and teeth of the upper jaw. The paroxysms came at first about once a week, but gradually increased in frequency and duration until the pain became nearly constant. During the last three years the paroxysms have recurred at intervals of about an hour each, lasting for several minutes. During the first two or three years the pain was referred to the region supplied by the superior maxillary alone; since then all three divisions have been affected.

Examination shows a well-nourished, rugged woman. Heart, lungs and abdomen negative. Left side of the face slightly smaller than the right. While talking, will suddenly be seized with a paroxysm of pain, which is referred to the whole left side of the tongue. During an attack there is spasm of the facial muscles on the left side, associated with a profuse secretion of tears, nasal mucus and saliva. There is also an apparent spasm of the muscles of the tongue, which prevents her from speaking while the pain lasts. The patient states that she has taken medicine nearly constantly for the last ten years in her effort to get relief. She has always refused morphin.

The patient was referred to the Chicago Policlinic Hospital and was operated on Oct. 31, 1896, the Hartley-Krause method being employed. No particular difficulty was encountered in performing the operation.

Hemorrhage from the middle meningeal was severe, but readily controlled by plugging the foramen spinosum with catgut. Krause's method of exposing and removing the ganglion was followed. The wound was drained with a narrow strip of iodoform gauze, and the osteoplastic flap sutured in place. The patient left the table without any apparent symptoms of shock. The duration of the operation was one honr and forty-five minutes. The gauze drain was removed on November 1. As soon as it was removed there occurred a profuse arterial hemorrhage from the opening left for drainage. This continuing, the patient was again anesthetized, the wound reopened, and the source of the hemorrhage found to be the trunk of the middle meningeal artery. The foramen spinosum was again plugged and the wound closed without drainage. No further complications ensued. The patient was up by the end of a week and left the hospital November 14, fourteen days after the operation.

From the time of return of consciousness after the operation the patient was absolutely free from pain. The area of anesthesia at the time of leaving the hospital corresponded practically to the region supplied by the fifth nerve. No trophic changes were noted in the skin or cornea. The eye was protected from the time of the operation until leaving the hospital and daily irrigated with a weak boric-acid solution.

The case was last examined in October, 1903, seven years after the operation. At this time she was absolutely free from pain and was in the best of health. The area of anesthesia, which at the time of the operation corresponded to the distribution of the left trifacial nerve, had diminished in size until an area a little larger than a silver dollar over the center of the cheek still remained completely anesthetic. In the remaining portions of the previously anesthetic area sensation had been partially restored. There was no trouble with the

eye, but the hearing in the left ear had not been restored.

Case 2.—C. B. W., referred by Dr. A. E. Palmer, of Morris, Ill. Ganglion removed by the Hartley-Krause method. Death, on the fifth day after the operation, from uremia.

History.—Patient, male, aged 71 years, had suffered from right-sided facial neuralgia for sixteen years. The first attack came on suddenly after exposure to cold and lasted for about three days. During this attack the pain was limited to the area supplied by the first division of the fifth nerve and was most severe in the eye. The second attack came on a year later. The pain has been nearly constant since that time, being referred to the parts supplied by the three divisions of the nerve, and most intense at the point of exit of the infraorbital nerve. About twelve years ago the infraorbital nerve was resected. This gave relief from the pain for about two months. Following this, during the next four years, five operations were performed on the peripheral branches, the supra- and infraorbital being each divided once, and the inferior dental being resected three times. After each of these operations the patient, though somewhat relieved, was never entirely free from pain. During the last seven years the paroxysms have recurred about every ten minutes. To secure relief he has, during the last five years, resorted to large and increasing doses of morphin and whisky several times daily.

Physical examination shows a well-preserved man for his years. Heart and lungs negative. Examination of the urine shows specific gravity 1.026. No albumin; no sugar; a few granular casts.

Operation on Nov. 29, 1898, under chloroform and morphin anesthesia. Following the usual preparations, the Hartley-Krause incision was made, reflecting an osteoplastic flap after the method of Wolff. The hemorrhage from the soft parts and from the bone was un-

usually severe. The middle meningeal, which occupied a complete bony channel in the temporal, was broken and was controlled with difficulty. No trouble was encountered in exposing and freeing the ganglion. The hemorrhage from the base of the skull was not excessive. The ganglion was freed from its attachments to the dura, the second and third divisions of the nerve divided with the scissors, and the ganglion twisted off from the first division and the sensory root. Drainage by means of a gauze strip from the bottom of the wound was secured. The osteoplastic flap was replaced and the wound closed by silkworm-gut sutures. Duration of operation, 1 hour and 45 minutes.

Following the operation the patient suffered a considerable degree of shock, the pulse reaching 130 by the time the operation was completed. From this he rapidly reacted and appeared in good condition. During the thirty-six hours following the operation the pulse and the temperature remained about normal. The mental condition was fairly good. At the end of this time no urine had been voided, but three ounces were secured by catheterization. This contained a large quantity of albumin, numerous hyaline and granular casts and red blood cells. From this time on he passed no more urine, the mind became clouded, the temperature and pulse slowly rose, until death in coma occurred on the fifth day after the operation. Postmortem examination of the operative field revealed no evidence of meningitis.

Case 3.—G. B. M., male, aged 50. Referred by Dr. H. T. Patrick. Operation, removal of the ganglion by the Hartley-Krause method. Recovery.

History.—Family history good. Past history of disease: Had only the usual diseases of childhood. Habits: Used alcohol and tobacco moderately.

Has had a left-sided facial neuralgia for seven years. First attack came on suddenly at night without any known cause. This subsided after two weeks. About three months later he had a second attack, which per-

sisted with slight remissions for seven years. During the last five years the pain has been referred to all divisions of the fifth nerve. The paroxysms during the last three years have been coming on about every ten minutes and last from one to three minutes. Patient has tried all kinds of remedies without securing any relief.

Physical examination shows well-nourished, but aged-appearing man. Heart, lungs and abdomen negative. There is some asymmetry of the face, the left side appearing somewhat smaller than the right. The conjunctiva of the left eye is injected. There is a profuse secretion of mucus from the left nostril and of tears from the left eye during the paroxysms of pain. The face over the infraorbital region and the left half of the tongue is extremely sensitive to touch and to heat and cold. Each paroxysm of pain is associated with spasm of the orbicularis palpebrarum and to a less degree of the other muscles of the left side of the face. Vision is normal. The special senses are not impaired.

Operation at the Chicago Policlinic Hospital, under chloroform and morphin anesthesia, Dec. 30, 1898. The technic was practically the same as in the preceding cases. The hemorrhage was not troublesome at any time. After the separation of the dura from the middle fossa down to the ganglion, the cavity was packed with gauze saturated with 2 per cent. gelatin solution for about five minutes. After the removal of the packing the operative field was practically dry, and no further hemorrhage of consequence occurred. The ganglion was elevated from its bed, freed of the dura, after which the second and third divisions were severed. The ganglion was then twisted free and removed apparently intact. The patient was in good condition during the operation and at all times afterward. There was no shock.

The following day examination of the face showed complete anesthesia over the part supplied by the sec-

ond and third divisions, but only partial anesthesia over the area of distribution of the first division. The patient was free from pain when discharged from the hospital on Jan. 16, 1899.

Two years after the operation, at my request, he presented himself for examination. At this time he complained of pain, most severe in cold weather, and principally at the point of exit of the infraorbital nerve and behind the orbit. Although this pain was not nearly so severe as it was before the operation, yet it caused him considerable anxiety for fear it would increase. Examination of the face showed that there still existed total anesthesia of the region supplied by the second and third divisions of the nerve, and that the sensation of pain and of heat and cold was entirely absent from the parts supplied by the infraorbital nerve. There was only partial anesthesia and area of distribution of first division. One year later he again consulted me. At that time he still had pain, but it was not so intense as before. The anesthetic area remained about the same. His general health was better and he appeared more cheerful. Since that time he has not reported his condition.

CASE 4.—T. J. H., male, aged 53. Referred by Dr. W. L. Baum. Operation: Removal of the Gasserian ganglion by Cushing's modification of the Hartley-Krause method. Recovery.

History.—Patient had had, in addition to the diseases of childhood, smallpox and several attacks of malaria. Has had gonorrhea, but denies syphilitic infection.

The disease for which he now seeks relief began with a sharp, constant pain in the right side of the face eleven years ago. The painful area has gradually extended so that at present it involves the whole lateral half of the face, the frontal and auricular regions and the tongue, corresponding accurately to the distribution of the right trifacial nerve. There is increased secre-

tion of the mucus from the right nostril, with injection of the conjunctiva of the right side, and spasm of the right half of the tongue with each paroxysm of pain. The patient suffers continually from pain, which is increased at intervals of about five minutes by sharp twinges referred to the area described.

Habits.—Patient uses whisky and tobacco moderately. Physical examination shows a well-nourished, healthy-appearing man. Nothing abnormal found in the chest or abdomen. Special senses not disturbed.

Operation at the Chicago Policlinic Hospital Nov. 9, 1900, under chloroform anesthesia. A horse-shoe-shaped flap, the convex border of which extended about four centimeters above the zygomatic process, was reflected. The zygoma was divided in two places, corresponding to the lower limits of the incision and reflected with the flap. The opening was further enlarged by biting away the base of the skull with a Macewen forceps. The middle meningeal was exposed in the posterior portion of the opening in the skull, but was not injured. The dura was readily separated from the base of the skull, and the hemorrhage from the veins controlled by packing the cavity with gauze saturated with 2 per cent. gelatin solution. The ganglion was exposed and removed, the technic following being that described in the previous cases. Nothing of importance occurred during the operation. The hemorrhage was not troublesome at any stage. At no time was there any serious danger of injuring the middle meningeal artery, which was held back out of the way by the retractor used to elevate the brain from the middle fossa. The patient made a rapid recovery after the operation and had no pain at any time. The anesthetic area corresponded to the distribution of the fifth nerve. He was discharged from the hospital, with the wound healed and free from pain, November 15, six days after the operation. He reported one and one-half years later that he was still free from pain, but he had difficulty in opening the

mouth, there being partial ankylosis of the temporo-maxillary articulation on that side. At the present writing he is still free from pain.

CASE 5.—C. E. G., female, aged 57. Operation: Removal of the Gasserian ganglion for left-sided facial neuralgia by Cushing's method. Recovery.

History.—Present trouble began seven years ago with severe pain in the face after exposure to cold. Since that time the pain has been nearly constant. Short intervals of relief have been obtained by section of the various peripheral branches of the fifth nerve. The last of these operations, resection of the inferior dental, was performed two years ago. This gave relief for about six weeks. The pain is now referred to the entire side of the face, being more severe at the points of exit of the supraorbital and infraorbital nerves. Medical treatment has been tried, but has given no relief.

Examination shows a poorly-nourished woman. The teeth have all been extracted with a view of relieving the pain. There are scars above and below the orbit on the left side, also over the body of the inferior maxilla. The face is slightly asymmetrical, the left side showing atrophy. The heart, lungs and abdomen show nothing abnormal. The urinary findings are negative.

Operation at the Chicago Policlinic Hospital March 3, 1901, under chloroform and morphin anesthesia. Cushing's method was employed. After reflection of the U-shaped flap and division of the zygoma, an opening was made close to the base of the skull with a small trephine. This was enlarged by biting away the bone with a Macewen forceps. No bone flap was preserved. The opening thus made in the skull was decidedly smaller than in our previous operations and the distance to the surface of the ganglion was less. No difficulty was experienced in reaching the ganglion nor in exposing and removing it. There was no hemorrhage from the middle meningeal and but slight oozing from the veins, for which a gauze tampon saturated in gela-

tin solution was employed with success, as in the preceding cases. The patient was in good condition during the operation. Recovery was uninterrupted, the wound healing by primary union. There was no pain at any time after the operation. There was unilateral anesthesia of the face and tongue corresponding to the parts supplied by the fifth nerve. No disturbance of vision or hearing was noted. The only complaint was of a feeling of numbness and anesthesia of the left side of the face. The patient was discharged from the hospital twenty-one days after the operation. She reports that, up to the present time, three and a half years after the operation, there has been no recurrence of pain.

CASE 6.—John N., aged 50. Operation: Removal of the Gasserian ganglion by Cushing's method. Death from suppurative meningitis on the sixth day after the operation.

History.—A connected history could not be obtained from the patient, as he could not speak English, and no interpreter could be obtained. From friends it was learned that he had suffered from left trifacial neuralgia for about ten years.

Operation at the Cook County Hospital on May 5, 1901. The steps of the operation were practically the same as in the preceding case, the Cushing incision with temporary resection of the zygoma being employed. The opening in the skull was made in the same manner as in the preceding case, no bone flap being retained. The hemorrhage was controlled in the same manner and was not troublesome at any time. The ganglion was readily exposed and removed. The wound was drained, as in all our cases, by means of a strip of iodoform gauze passed down to the bottom of the cavity and brought out at the posterior inferior angle of the wound. The subdural space was not opened, excepting where the ganglion was uncovered. The time consumed in the operation (one hour and ten minutes) was shorter

than in any of our previous operations, and there was a minimum amount of trauma to the brain. The patient left the operating table in good condition. During the first three days following he continued to improve. The wound was dressed and the drainage removed at the end of the third day, a second piece of gauze being inserted where the primary drainage had been placed. Twelve hours after the dressing the temperature and pulse began to rise. Delirium with vomiting and rigidity of the neck muscles quickly followed. Death in coma followed on the sixth day after the operation. Autopsy revealed suppurative basilar meningitis, with chronic nephritis and chronic myocarditis. The ganglion had been completely removed.

CASE 7.—G. B. Referred by Dr. Christianson. Male, aged 71. Right facial neuralgia of about 15 years' standing. Resection of right Gasserian ganglion. Meningitis beginning on ninth day after operation. Death on thirteenth day from leptomeningitis. Infection probably from an old empyema of the sphenoidal sinus.

History.—About 20 years ago had first attack of neuralgia. At that time the pain was limited to the inferior dental nerve and lasted but a short time. No further trouble was experienced for five years, when pain returned and has continued with increasing severity until the present time. Since 1894 it has involved all three divisions of the fifth nerve, being most acute over the supraorbital and inferior maxillary nerves. The paroxysms recur, each beginning with pain in the angle of the mouth on the right side and radiating up the side of the nose and over the eye. Any movement of the jaws initiates severe pain in the temperomaxillary articulation, which radiates downward along the inferior dental nerve to the mental foramen. In 1899 Dr. E. Andrews, of Chicago, resected a large portion of the inferior dental nerve. This gave partial relief for six months. Last summer (1903) the infraorbital nerve

was removed at the West Side Hospital. This did not give any relief.

Habits.—Uses tobacco excessively, alcohol moderately. Has had to resort to morphin since returning from the hospital in 1903. Now uses about three grains a day. Venereal infection of any kind denied. Has had malaria and rheumatism.

Physical Examination.—Revealed no abnormal condition of chest or abdomen. Urinary findings were negative, as was also that of the blood. The right side of the face is scarred from previous operations on the infraorbital and inferior dental nerves. The teeth were all extracted shortly after the pain began.

Operation at St. Luke's Hospital March 17, 1904. Cushing's modification of the Hartley-Krause incision, following the technic described in preceding cases. Hemorrhage moderately severe from an accidental wound of the main trunk of the middle meningeal artery caused by tearing the dura and lacerating the vessel while separating the dura from the skull after making the primary trephine opening. This accident, which could have been avoided, caused considerable delay. The hemorrhage was controlled by double ligation of the vessel. The ganglion was easily reached and freed from its dural attachment. It was grasped with a strong forceps and torn from its bed after cutting the second and third divisions close to their foramina of exit. With the ganglion the major portion of the sensory root was removed. The venous hemorrhage was slight. The sinus was not opened. The wound was drained by a small strip of iodoform gauze, the zygoma replaced and the muscle flap sutured with catgut. The skin flaps were sutured with silkworm gut. The patient left the table in a fairly good condition. The following day the temperature was normal and the pulse about 100. At the end of 24 hours the gauze drain was removed, and the skin sutures on the third day. The wound healed by primary union. The temperature and

pulse remained normal until the ninth day. The patient after the fifth day was up and walking about the ward. On the morning of the ninth day, at 5 a. m., the temperature registered normal. At 9 a. m. the patient had a severe chill and complained of headache. The temperature was then 104, the pulse 132. Blood count showed 42,000 whites. From this time on the temperature ranged from 102 to 105, the pulse from 110 to 160. The mental condition was fairly good until a few hours before death. There was no rigidity of the neck muscles at any time. The pupils were equal and both reacted to light at all times. After the initial chill he frequently complained of feeling cold, but had no distinct chill. Death, apparently from exhaustion, took place on the thirteenth day after the operation.

Autopsy.—Within four hours after death, by Dr. Gideon Wells, of the Chicago University. A summary of the postmortem findings are: Acute suppurative cerebral leptomeningitis; scar of recent operation wound in right temporal region; defect in sphenoid bone; empyema of sphenoidal sinus; absence of the right Gasserian ganglion; senile pulmonary emphysema, and slight arterial sclerosis.

Bacteriologic examination showed the presence of streptococci and the diplococcus intracellularis.

A rational explanation of the origin of the infection is that it was due to the breaking up of the granulation barrier that alone closed the defect in the lateral wall of the right sphenoidal sinus. That there existed an ancient sphenoidal sinus infection with a defect in the wall of the sinus, apparently from necrosis, there is no doubt. During the operation the wall of granulation tissue that had prevented intracranial infection had been disturbed. Following an acute exacerbation of the chronic empyema, infective matter had escaped into the subarachnoid space and caused the meningitis. Immediately following the operation the patient presented

symptoms of a mild coryza, with a mucopurulent discharge from the nostrils, and complained of having taken cold as a result of shaving the head. It is extremely doubtful, though possible, that the infection was carried into the cranial cavity at the time of the operation. Meningitis under these conditions would have developed ordinarily within four days after the op-

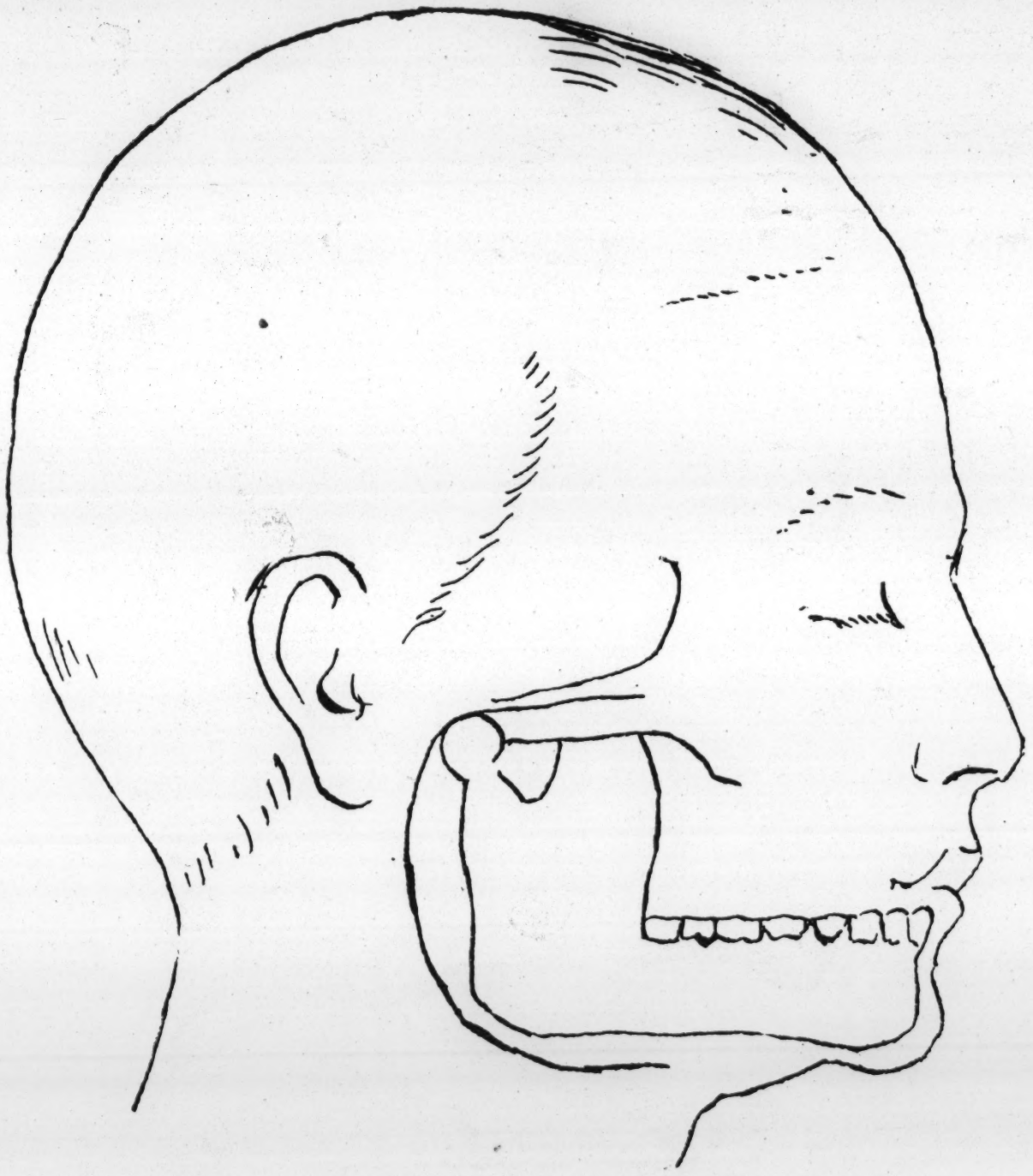


Fig. 1.—Rose-Andrews operation. Skin incision.

eration. The drainage and sutures having been removed early (24 hours and 3 days), and the primary healing of the wound, would argue against this being the source of the infection.

METHODS OF OPERATING.

The operators who first conceived the idea of attacking the trifacial nerve within the cranium were satis-

fied with simple resection of the nerve (second and third divisions) close to the base of the skull. This operation, as those on the branches outside of the cranial cavity, was found inadequate because of the frequent relapses that followed. To Rose, of London, is due the credit of first attempting to remove the Gasserian gan-

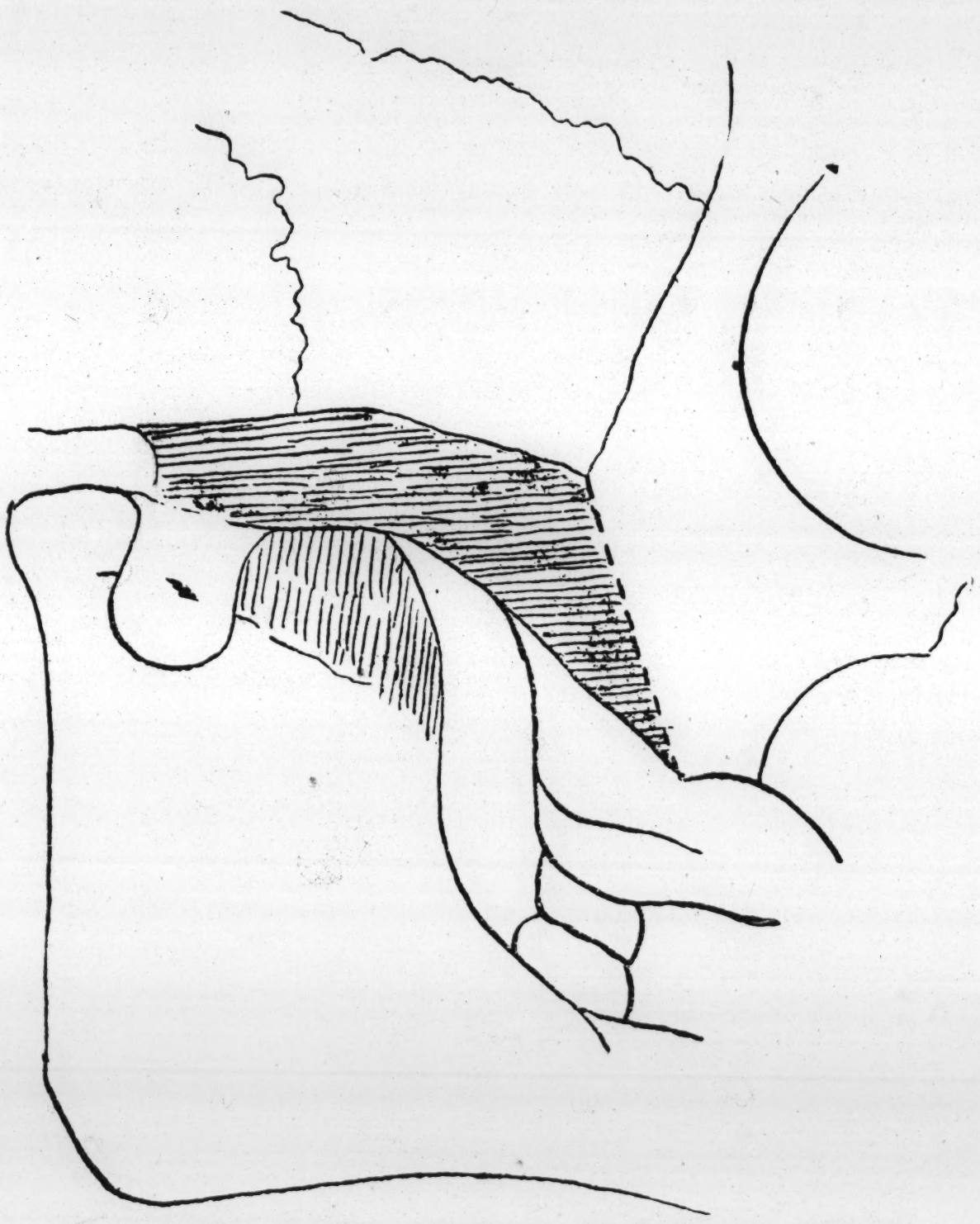


Fig. 2.—Rose-Andrews operation. Showing bone removed.

glion and the portions of the fifth nerve between it and their foramina of exit. Andrews, of Chicago, independently devised a method nearly identical with that followed by Rose, but did not operate until some time later.

The steps of the Rose-Andrews operation are as follows:

1. A skin incision beginning near the external angular process of the frontal, curved horizontally just above the zygoma, then downward just in front of the ear, terminating near the angle of the jaw (Fig. 1).

2. Reflecting a flap of skin and subcutaneous tissue.

3. Sawing through the zygomatic arch and reflecting it downward with the attached masseter muscle (Fig. 2).

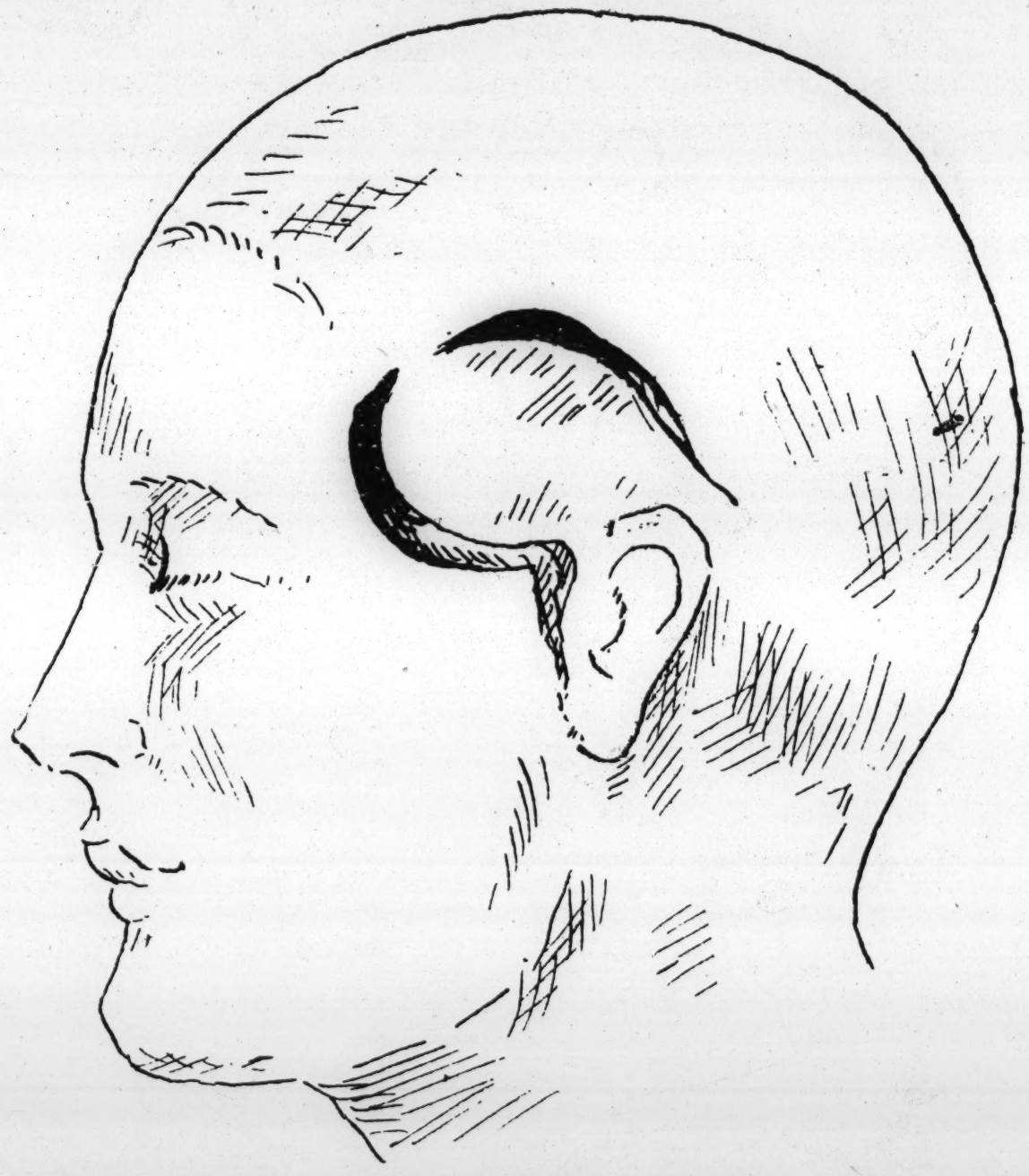


Fig. 3.—Doyen's tempero-sphenoidal operation. Skin incision.

4. The coronoid process is sawn through and turned upward with the attached temporal muscle.

5. Ligation of the internal maxillary artery.

6. Location of the posterior sharp edge of the external pterygoid plate of the sphenoid. The foramen ovale is found near the base.

7. A probe is passed through the foramen and the ganglion is transfixed.

8. A trephine is applied to the base of the skull just external to the foramen ovale.

9. The bone between the foramen and the trephine opening is removed with a Rongeur forceps.

10. The ganglion is removed by curettage.

The dangers of this operation are so great and the disadvantages so apparent that it has been generally abandoned. Among the chief difficulties encountered may be mentioned the small space within which one must work, the abundant hemorrhage that obscures the

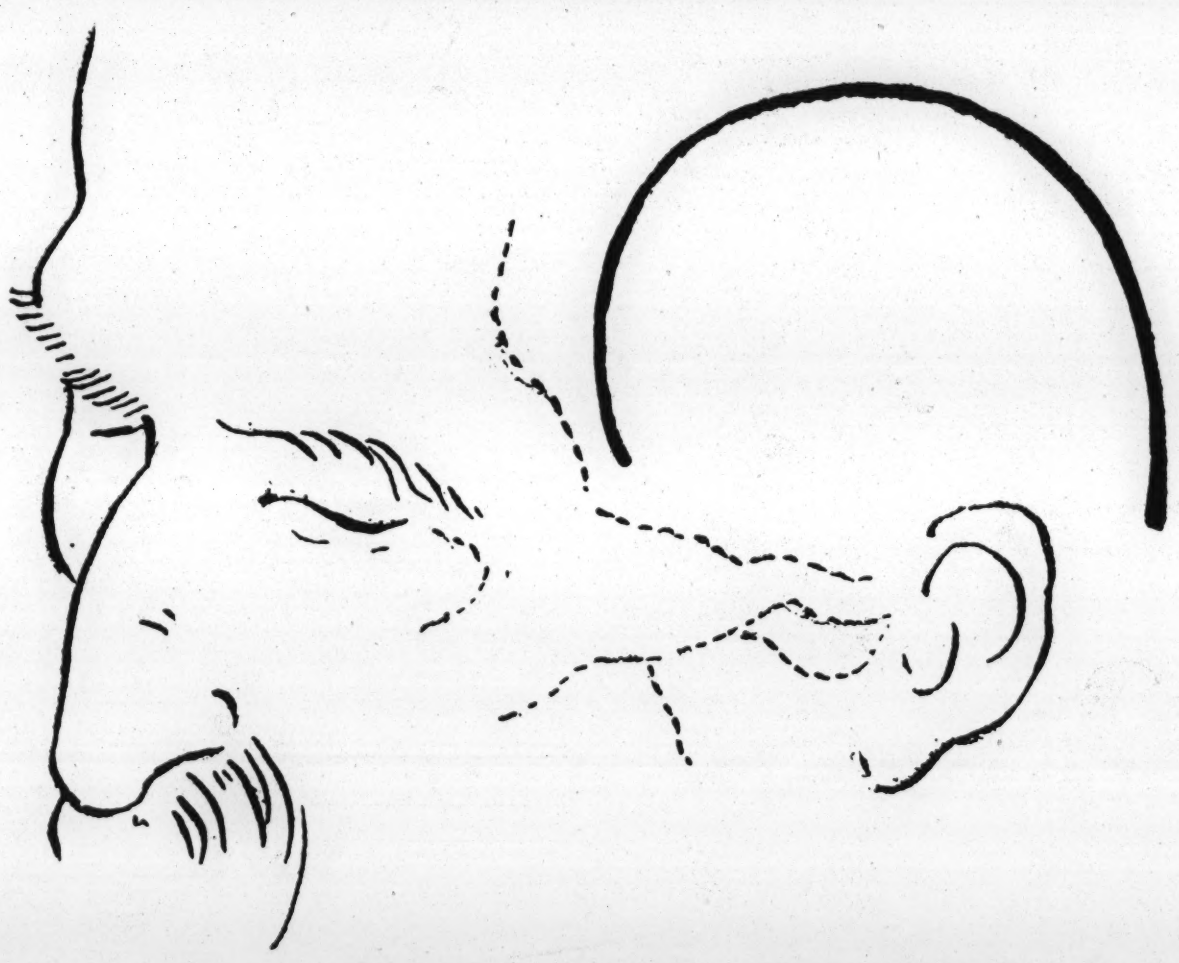


Fig. 4.—Horsley's operation. Skin incision.

field of operation, and the arduous, if not impossible, task of reaching the ganglion through this opening in the base of the skull. Hemorrhage from the middle meningeal artery resulting from a wound received during the operation is frequently a source of trouble and is extremely difficult to control.

The greatest danger, however, arises from accidental injury to the Eustachian tube, which lies in close proximity to the operation wound. In all the cases in which the infection occurred it was from the Eustachian tube. Rose lost one of his cases forty-eight hours after the op-

eration from meningitis, the infection starting from a wound in the tube. Caponotto lost one four days after the operation from the same cause.

Unimportant modifications of this method have been introduced by a number of surgeons. Park employed an H-shaped, Artieda a U-shaped and Doyen a vertical skin incision. It is extremely doubtful, however, if any who followed this route succeeded in removing the ganglion.

Temporosphenoidal Method of Doyen.—As before stated, Doyen at first used a modification of the Rose-Andrews method in reaching the ganglion. In 1895 he proposed a new route, which he called the temporosphenoidal (Fig. 3). This operation consists in making a skin incision similar to that of Hartley's and reflecting a flap which includes all of the tissues down to the bone. The zygomatic arch is resected close to the condyle, the coronoid process divided, and the temporal fossa denuded. A trephine opening is then made at the level of the sphenotemporal suture and all of the bone removed with a cutting forceps down to the foramen ovale. This method, it will be seen, has the advantage that it gives a large operation field and permits the easy removal of the ganglion.

Horsley's Method.—The operation devised by Horsley (Fig. 4) in 1890 consists in making a skin incision starting from the anterior extremity of the zygoma and running upward to the temporal ridge, following that line and descending along it to the asterion.

A flap, including all of the tissues down to the bone, is then reflected. The temporosphenoidal lobe is exposed by removing the whole squamous portion of the temporal bone with a trephine and forceps, and opening the dura by an incision corresponding to the opening in the bone. A broad, smooth retractor is then slipped underneath the lobe and slowly and steadily raised, thus elevating the temporosphenoidal lobe from the floor of the skull. The guide to the fifth nerve is

the upper border of the petrous bone. Elevating the brain a little more, it will show the tentorium, and the point at which the nerve passes beneath it can be seen. The ganglion is then reached by following along the nerve, and after it is fully exposed is enucleated, together with its sensory root.

This operation proved extremely dangerous because of the injury inflicted on the brain and the great risk of infection that opening the dura incurs. Hemorrhage from the veins at the base of the skull proved very troublesome and was in one instance sufficient to cause death.

The Hartley-Krause Method.—The operation that is practiced by nearly all surgeons is that originated by Hartley, of New York (Figs. 5 and 6) and later employed independently by Prof. F. Krause. As this is the method that has been chosen in the past by most surgeons, its technic will be considered somewhat in detail.

The steps of the operation are as follows:

1. A horseshoe-shaped skin incision, having its base at the zygoma, the greatest distance between the two arms being about three inches and the vertical measurements from the top of the arch to the base about the same.

2. Resecting an osteoplastic flap, the bone at the base of this flap being broken well down below the zygoma.

3. Separation of the dura from the floor of the middle fossa.

4. Exposure of the second and third divisions of the fifth nerve as they enter the foramina rotundum and ovale.

5. This step in Hartley's operation consisted in resecting the second and third divisions between their foramina of exit and the Gasserian ganglion. He made no attempt to remove the ganglion.

6. Recognition and extirpation of the ganglion. To Krause belongs the credit of perfecting the technic of

this step of the operation and of first removing the ganglion by this route.

As soon as the brain has been lifted from the middle fossa and the hemorrhage checked, the second and third divisions can be readily recognized by the folds produced by elevating the dura. The ganglion lies at the junction of the axes of the second and third divisions. The two branches are uncovered, the dissection being carried up-

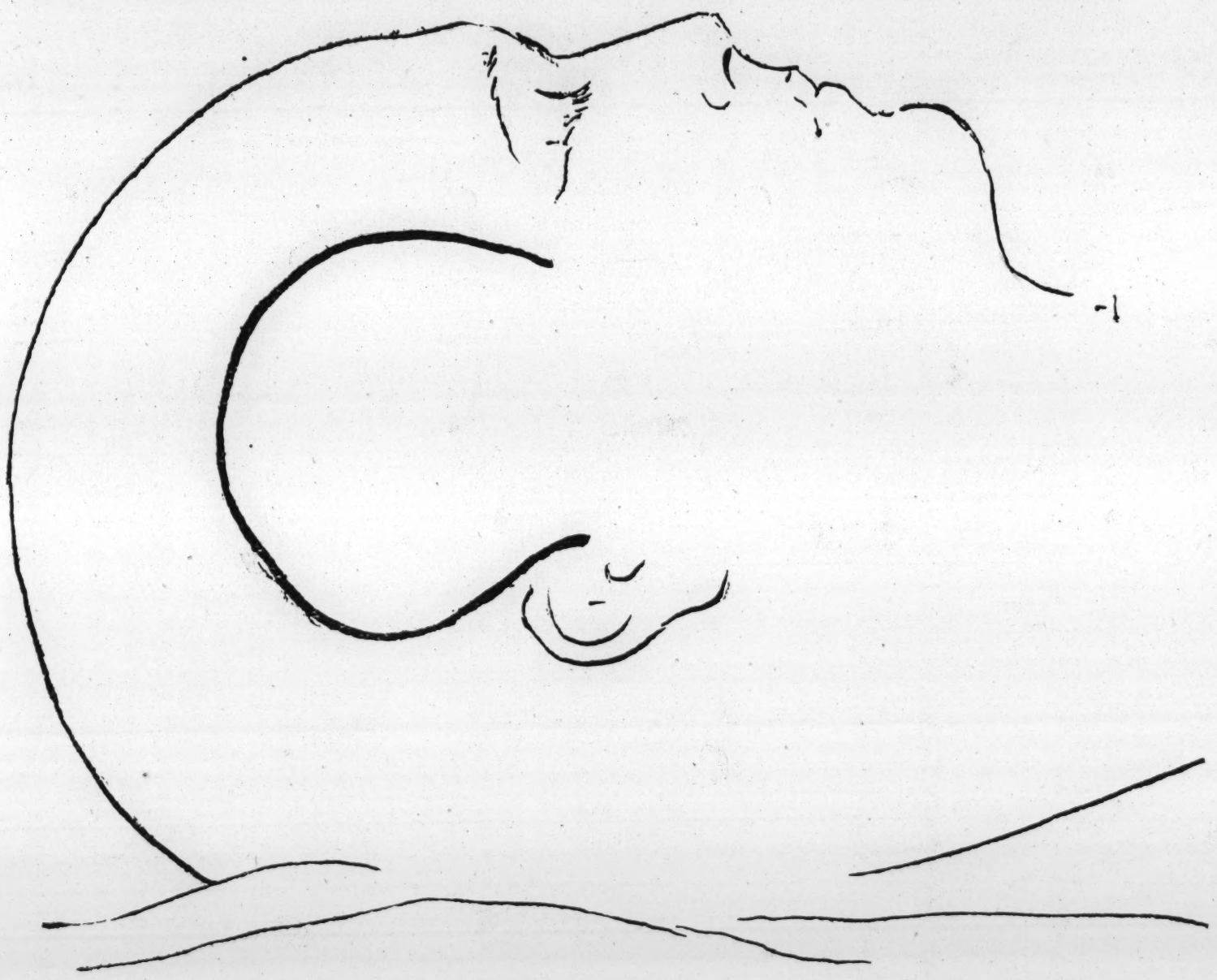


Fig. 5.—Hartley-Krause operation. Skin incision.

ward until the ganglion, which rests between two layers of the dura, is completely exposed. The ganglion is then seized with a pair of artery forceps, the second and third divisions are divided close to the base of the skull, and the ganglion removed by twisting the forceps.

Difficulties Encountered in the Course of the Operation.—In discussing in detail the different steps, as

above outlined, the first that deserves consideration is the means to be employed in gaining access to the cranial cavity after the temporal flap has been outlined.

Hartley in his operations used a chisel to cut a groove in the bone corresponding to the skin incision. This groove went only to the vitreous plate, excepting at the upper angle, where it went through the whole thickness of the bone. An elevator was introduced at this point and the remaining portions of the bone fractured.

Krause cut through the bone with a small circular

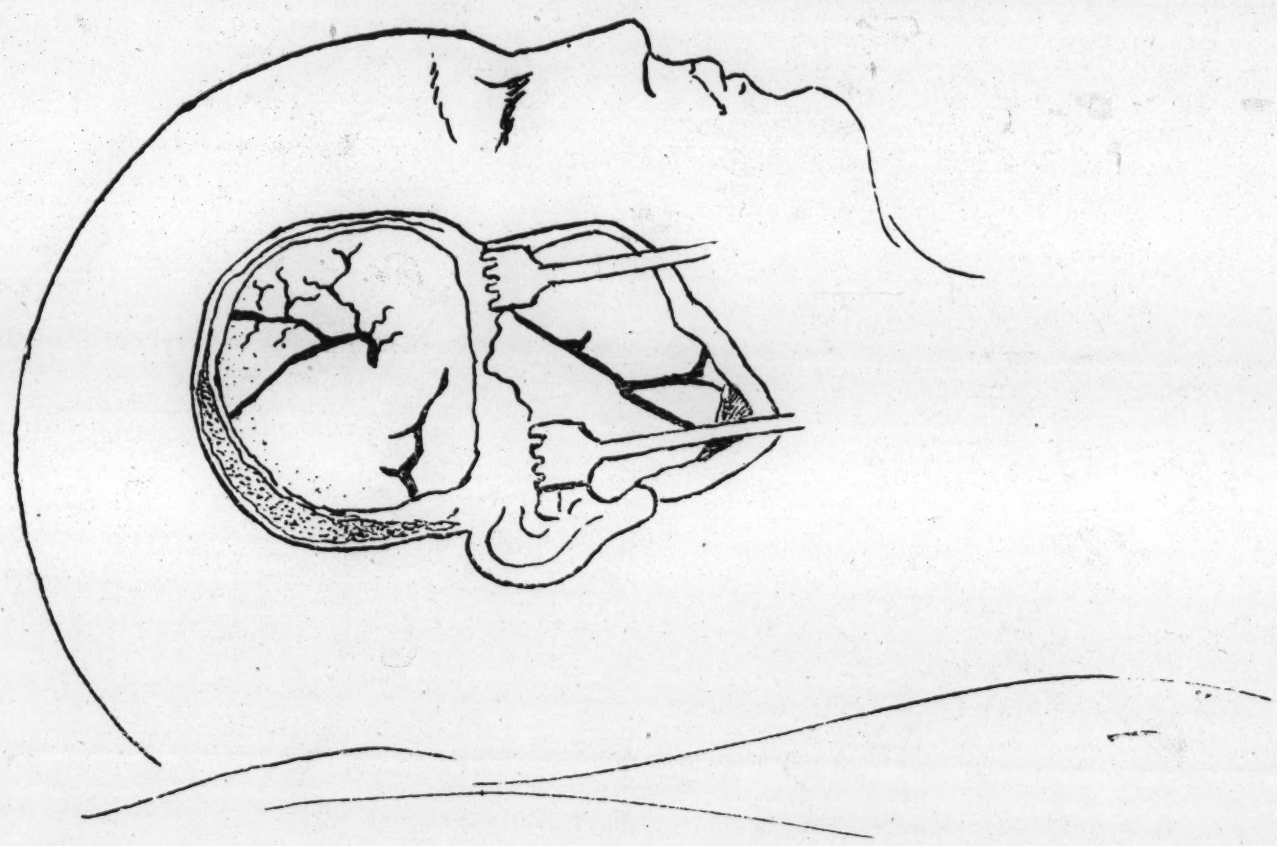


Fig. 6.—Hartley-Krause operation. Osteoplastic flap reflected. Dura exposed.

saw attached to a dental engine. Keen recommends either Cryel's drill or Pyle's chisel.

The method that we have used and the one that is to be recommended because of the rapidity and ease with which it allows the surgeon to work is the one adopted by Murphy, and consists in, first, making a small trephine opening and then cutting the bone with a De Vilbiss forceps. After the bone has been cut through along the line of the skin incision an elevator is introduced underneath the apex of the flap and the bone

fractured along the base line. The opening is then enlarged by cutting away with the forceps the rough edge of the bone along the line of fracture.

Separation of the dura from the base of the skull can in most cases be easily accomplished. Gerster makes the statement that in certain individuals, owing to local peculiarities in the skull, it may be very difficult. This is often the case in the male where the irregularities of the base are accentuated and permit the firm attachment of the dura. In the female the surface

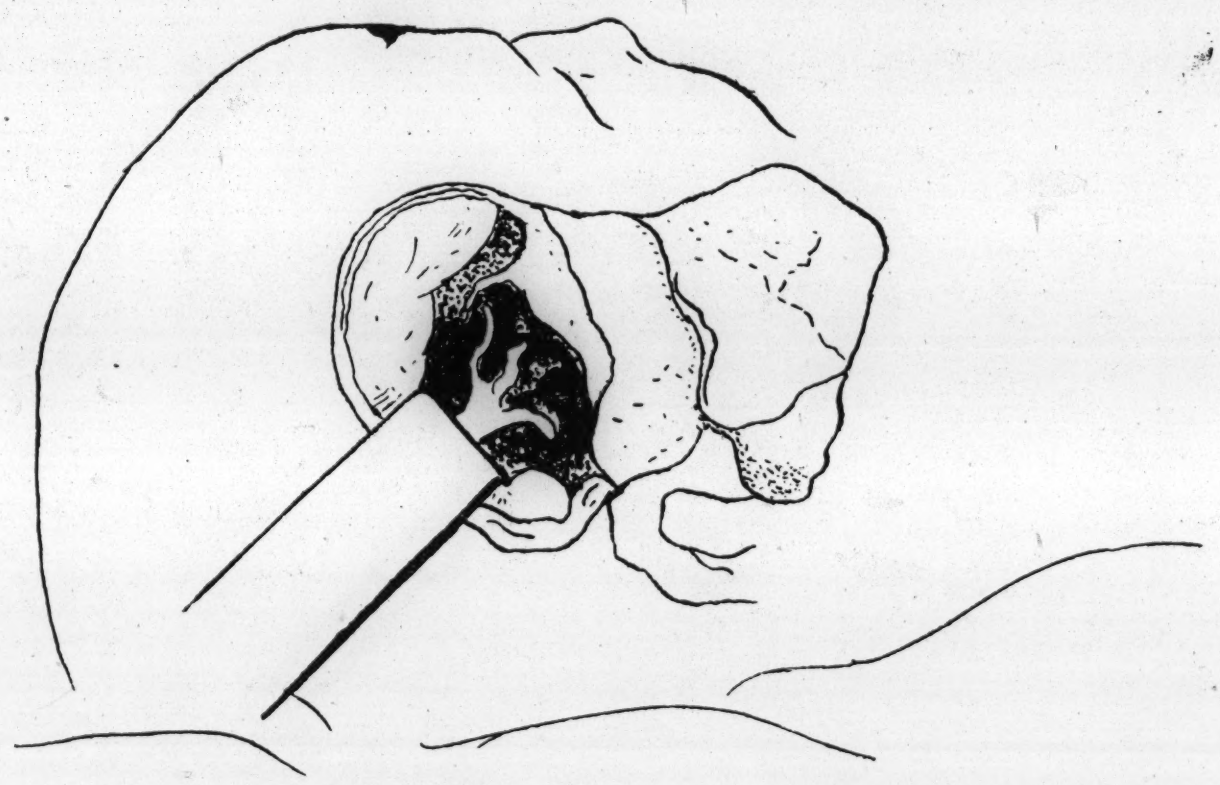


Fig. 7.—Hartley-Krause operation. Ganglion exposed.

of the bone is relatively smooth, as a consequence of which separation is less difficult.

The force that may be employed with safety to the dura varies considerably in different individuals. In some instances it is found greatly thickened and extremely resistant, as in a case reported by Eskridge and Baker, where it had nearly the consistency of bone. In one of Richardson's cases the dura was so soft and friable that, in spite of all precautions, it was repeatedly torn in attempting to separate it from the base.

Tearing of the dura in this step of the operation is,

however, not an accident of much consequence. It subjects the patient to an additional risk of infection and permits of injury to the brain. The first danger may be obviated by diligent attention to asepsis, and the second by protecting the brain as much as possible while operating by keeping it covered with dura and by the use of a Hartley retractor in the hands of a skilled assistant.

Tiffany advises incising the dura to allow the escape of cerebrospinal fluid. Richardson incised the dura in one case and claims that the evacuation of cerebrospinal fluid facilitated subsequent maneuvers.

Hemorrhage is by far the most important feature of the operation that we are called on to deal with. In most cases it can be controlled so as to allow completion of the operation. In a few it is so severe that the surgeon is forced to resort to packing, the operation being completed at a subsequent sitting.

In the course of the operation we encounter hemorrhage from a number of different sources. These are:

1. Hemorrhage from the soft parts, principally from the branches of the temporal artery. This is severe for a few moments, but can generally be controlled by pressure and forceps as soon as the flap has been reflected.

2. From the middle meningeal artery, either from the main trunk or from its branches. Hemorrhage from one of its branches, usually the anterior, is not of much importance and can easily be checked by ligature when the vessel rests in a groove in the bone, or by plugging with catgut or gauze when it is encased in a complete bony channel. Hemorrhage from the main trunk is always profuse and frequently difficult to control. Krause ligates the artery at its exit from the foramen at the base of the skull. This is not easily accomplished and is impossible in case the artery passes directly into a bony channel. In such a case the artery must first be

freed by chiseling, and then it is possible to ligate, as was done in the cases of Czerny and Finney. When the artery presents no anomalous condition, the quickest and surest way of checking hemorrhage from its trunk is to plug the foramen spinosum with catgut wool, as was done by Finney, or with a small piece of iodoform gauze.

Fowler recommends preliminary ligation of the external carotid artery as a means of controlling hemorrhage. This procedure has not proven satisfactory, as the abundant anastomosis of this vessel with those of the opposite side and with branches of the internal carotid renders it of little value.

3. Hemorrhage from the small veins at the base of the skull, which are torn as the dura is separated from the bone, is extremely troublesome and frequently prevents completion of the operation. It is best controlled by packing the cavity with a strip of gauze saturated in a 2 per cent. solution of gelatin and then permitting the brain to fall back in place for five or ten minutes. This will quickly control the bleeding and permit the operator to continue. In some cases the hemorrhage from this source has been so profuse and troublesome as to make the removal of the ganglion impossible. Keen, Krause and others have been forced to pack the wound and delay the completion of the operation until a later day. As the danger of sepsis is greatly enhanced by operating in two steps, every effort should be made to complete the operation in one sitting.

4. Hemorrhage from the cavernous sinus is usually the result of tearing of the sinus at the moment the ganglion is torn from its attachment. Occasionally the sinus wall is punctured during the process of separation of the dura from the ganglion or when an attempt is made to resect the first division of the fifth nerve.

Hemorrhage from this source, although at times alarming, is easily controlled by packing with gauze;

it sometimes necessitates postponement of the operation. The sinus has been opened by Krause, Finney, Abbe and Keen without any serious results. In the case of Charlot, in which the sinus was punctured, a fatal termination ensued.

The internal carotid artery, which lies a little anterior and close to the inner side of the ganglion, might easily be injured and thus be a source of fatal hemorrhage. So far this accident has not been recorded; with due care and the use of dull dissection alone it can always be avoided.

Next to hemorrhage we have compression of the brain as the most serious condition which we should guard against. A slight amount of compression from pressure of the retractor on the cortex is unavoidable, but rarely occasions any untoward symptoms. This compression can be minimized by use of the Hartley retractor and by care on the part of the assistant whose duty it is to lift the brain. Preserving the dura and the cerebrospinal fluid intact also greatly diminishes the chances of serious cortical compression.

In one of Krause's cases, in which the operation was performed for left-sided neuralgia, the patient suffered from slight aphasia for twenty-four hours after the operation. In a similar case operated on by Walton, in which the dura was torn in several places and the left temporosphenoidal lobe was considerably lacerated, aphasic symptoms, with loss of memory, persisted for five days.

Symptoms of general cerebral compression from local pressure, influencing the distribution of the cerebrospinal fluid, have been noted. In a case operated on by Fowler pressure on the frontal lobe forced the cerebrospinal fluid from the lateral ventricles in the medulla, causing alarming dyspnea from disturbance of the respiratory center.

Postoperative compression symptoms have resulted

from retention of wound secretions in one of Krause's cases and from secondary hemorrhage after removal of the gauze packing in one of Marchant's. To prevent

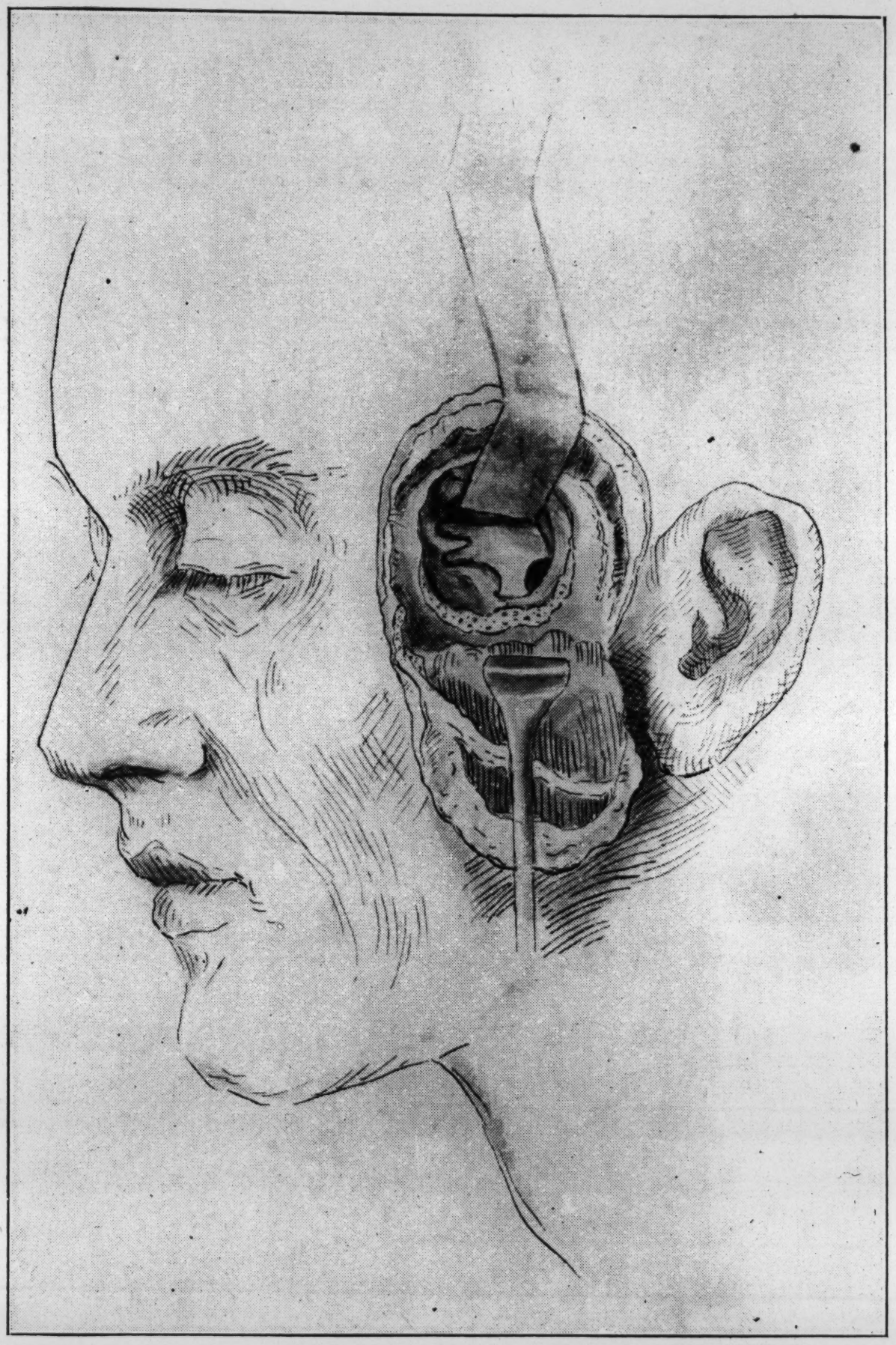


Fig. 8.—Cushing's infra-arterial method. Ganglion exposed.

this accident Krause and Marchant advise the use of tubular drainage in addition to the gauze packing. In a case operated on by von Beck, in which he twisted the

main trunk of the middle meningeal artery, pronounced compression symptoms developed on the eleventh day after the operation as the result of secondary hemorrhage from the middle meningeal. The wound was reopened, the clot removed, and the hemorrhage checked by a provisional gauze tampon and the subsequent use

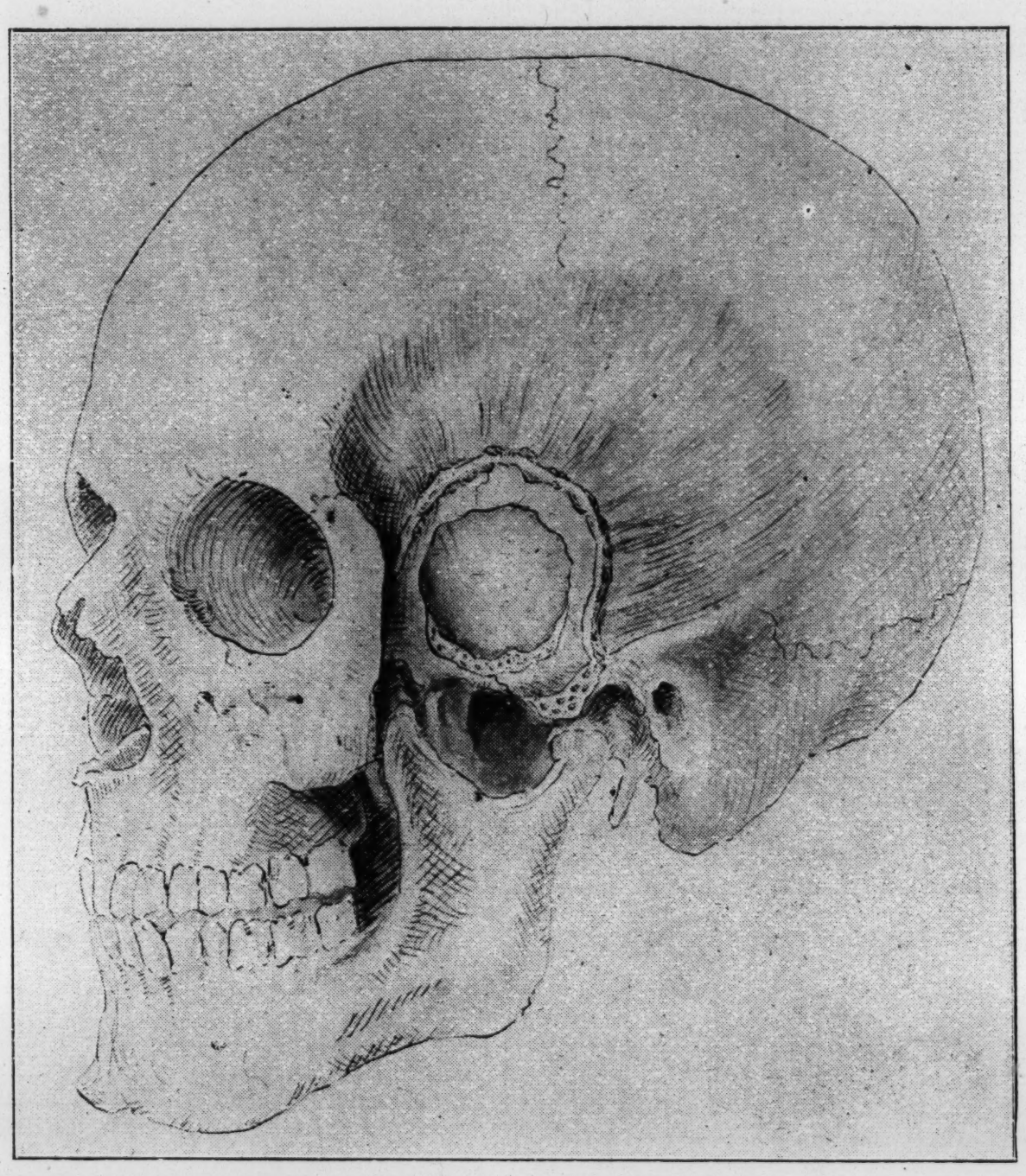


Fig. 9.—Cushing's operation. Showing size and position of opening in the skull.

of the actual cautery. The compression symptoms then disappeared.

Cushing's Direct or Infra-arterial Method.—A modification of the Hartley-Krause operation possesses important points of superiority over the original operation as here outlined. The steps of Cushing's (Figs. 8 and 9) operation are as follows:

1. A U-shaped flap five centimeters high, with a base four centimeters wide, corresponding to the zygoma. This is considerably smaller than the flap reflected in the Hartley-Krause operation.

2. Incision of the temporal fascia concentric with the skin incision, with subsequent elevation of the periosteum of the zygomatic arch.

3. Division of the zygomatic arch at two points corresponding to the extremities of the skin incision.

4. The temporal fossa is then cleared of the temporal muscle over an area equal to the skin flap. This muscle, with the zygoma, is then retracted strongly downward. In this way the lower part of the temporal fossa is exposed as low down as the attachment of the external pterygoid muscle. The skull is then opened at the most prominent part of the great wing of the sphenoid. Cushing prefers a mallet and gouge for making the primary opening. With a Rongeur forceps the opening is enlarged downward to the ridge between the temporal and zygomatic fossæ. The anterior branch of the middle meningeal artery crosses the center of the opening.

The succeeding steps of the operation, elevation of the dura, liberation and extraction of the ganglion, do not differ materially from those described under the Hartley-Krause method. In closing the wound, as no attempt has been made to preserve the bone flap, it is only necessary to replace the zygoma and to suture the muscle and skin flap. Cushing does not drain.

We have employed this method in four of our cases and are convinced that it possesses all of the advantages over the Hartley-Krause operation that are claimed for it by Cushing. In our work we found that the hemorrhage from the superficial soft parts was considerably less, as was also that from the venæ Santorini. The ganglion, owing to the low position of the cranial opening, was much more accessible. The middle meningeal artery, always a source of danger in the Hartley-Krause

operation, was not injured, excepting in our last case, nor was it a source of anxiety during the most critical part of the operation. Ligation of the main trunk of the vessel, considered essential by Krause, was not found necessary.

Our technic differed but slightly from Cushing's. We make the primary opening in the skull with a small (half-inch) trephine, not at the most prominent part of the great wing of the sphenoid, but half an inch below and anterior to that point, thus avoiding in most cases placing the primary opening over the middle meningeal artery. This opening is then enlarged with a Rongeur forceps below, above and backwards, first separating the dura for some distance to protect the middle meningeal. In freeing the ganglion the method of Krause was employed in all our cases. Only in the cases operated on by the Hartley-Krause method did we attempt to preserve the bone flap. The small size and low position of the opening in the skull in Cushing's operation and the protection offered by the replaced zygoma and soft parts obviate the necessity of preserving the bone.

The question of drainage is still open. Cushing does not recommend it. In our cases the amount of oozing that followed seemed to justify this procedure. However, it is unquestionably a source of danger, as was evidenced in our Case 6, where the patient succumbed to a suppurative meningitis from an infection traveling along the drainage track.

RESULTS OF THE OPERATION.

Anesthesia.—After removal of the ganglion it will generally be found that the sensation of pain is abolished over an area corresponding nearly to the part supplied by the fifth nerve. Ordinary sensation is affected to a much less extent. The sensation of heat and cold is frequently perverted. The area of complete anesthesia, however, quickly diminishes in size after the operation, the periphery first regaining sensation.

In a case examined by Krause two years and three months after the operation, in which immediately following the anesthesia was typical, the limits of the anesthetic area were far less clearly marked and its size was greatly diminished.

In two of Tiffany's cases, one examined two years and four months and the other three years and eight months after the operation, the anesthetic area in each was considerably diminished in size and changed in outline. Von Beck noted the return of sensation to the periphery of the anesthetic zone fourteen days after removal of the ganglion.

In our Case 1 the area of total anesthesia had diminished in size during the first two years after the operation until it was but slightly larger than a silver dollar. In the remaining portions of the previously anesthetic area, which corresponded to the distribution of the fifth nerve, sensation was not wholly destroyed. Five years after this the conditions remained practically the same.

Motor Disturbances.—In nearly all the cases the motor root of the fifth is divided with the inferior maxillary division. As the muscles of mastication are supplied by this nerve, they are consequently paralyzed after its division.

This paralysis is of little consequence, as the muscles of the opposite side sufficiently assume the functions of those paralyzed to cause but little inconvenience to the patient. Paralysis of the buccinator is, of course, never complete, as it derives its nerve supply from two sources —the facial and the fifth.

At times, after removal of the ganglion, there exists, to a greater or less degree, ankylosis of the temporomaxillary articulation. Quénu considers this to be the result of trophic changes, with secondary contraction of the temporal and masseter muscles. It may also be due to direct injury, at the time of the operation, to

these muscles or to the temporomaxillary articulation. As a rule, this difficulty quickly disappears, and only in a single case has it called for operative treatment. In one of our patients, Case 4, ankylosis, probably due to the contraction of periarticular fibrous tissue, followed the Cushing operation. At the end of six months the patient was able to separate the teeth only a half an inch. Since then his condition has greatly improved, although the ankylosis has not entirely disappeared. The joint cavity was not opened at the time of the operation.

Effects on the Eye.—In all cases where the ganglion has been removed there will be complete corneal and conjunctival anesthesia. This of itself is of little importance. At times, however, ulceration, opacity and softening of the cornea follow destruction of the ganglion or the intracranial division of the nerves. In a few cases panophthalmitis has resulted, necessitating enucleation. This occurred in cases operated on by Keen, Krause, Rose and Tiffany.

The cause of the eye lesions has as yet not been definitely settled. Most physiologists have heretofore regarded the fifth nerve as the trophic nerve of the eye, and on these grounds surgeons have attributed the loss of the eye to trophic changes. Within recent years experiments have been made by Gley, Ferrier and Turner which go to prove that the trifacial exerts no trophic influence over the eye, and that when destruction of the eye follows removal of the ganglion it is the result of infection and trauma which the anesthetic condition of the cornea favors. After a number of experiments on animals Turner concludes that "there is no evidence of trophic influence exerted by the Gasserian ganglion on the cornea, and that, provided septic organisms are excluded, the ophthalmic branch may be safely divided or the Gasserian ganglion removed without fear of disorganization of the eye."

Doyen states that the loss of the eye in animals after

division of the trifacial is always due to trauma, and that the sympathetic alone presides over the nutrition of the eye. Spiller, van Gehuchten and others have shown that sympathetic fibers probably enter the fifth nerve through the ganglion and are distributed to the parts supplied by the trifacial. That these fibers preside over the nutrition of the eye has not yet been definitely proven.

It may be remarked, in support of the theory that eye lesions are due to trauma and infection, that in cases reported where the eye has been properly protected during and after the operation corneal ulcers or loss of the eye have not been reported.

In every case the eye should be covered with an occlusion dressing during the operation and carefully protected for some time afterward. Krause advises the use of atropin before and after the operation, with daily irrigation of the eye with boric-acid solution. Keen recommends closing the eye by means of adhesive plaster strips attached to the lids, or by suturing the lids after freshening the margins at one place. In none of our cases did any serious eye symptoms follow removal of the ganglion.

Dryness of the cornea from arrest of the secretion of tears, attributed by Krause to destruction of the great superficial petrosal nerve, also acts as a predisposing cause of corneal ulceration. This can be remedied in part by frequent irrigation of the eye and, as von Hippel recommends, by keeping the patient in a moist atmosphere.

Paralysis of the eye muscles, with ptosis from injury to the third, fourth and sixth nerves as they pass through the external wall of the cavernous tissue, has in several instances been noted. These nerves have usually been injured when an attempt has been made to divide the ophthalmic division of the trifacial. The paralysis following injury to these nerves has been for-

tunately, in most cases, of short duration, disappearing, as a rule, within a few weeks.

Effects on the Ear.—After removal of the Gasserian ganglion there may be complete or partial loss of hearing on the affected side. This may be the result of paralysis of the tensor tympani, which receives its nerve supply from the motor root of the fifth, or from edema of the tympanic membrane as a consequence of the vasomotor disturbance that frequently follows division of the trifacial. Occasionally suppurative inflammation of the middle ear ensues; this is due to infection of the serous exudate in the middle ear which is present as the result of vasomotor paralysis.

Paralysis of the seventh nerve, complete and permanent, followed the partial removal of the ganglion in a case operated on by Harry Sherman. Although the operator was unable to offer any explanation of its occurrence, it was probably due to pressure made on the extracranial portion of the nerve during the course of the operation.

Relapses.—Recurrences of pain after removal of the Gasserian ganglion have been recorded by Rose, Keen, Krause, Dana, and others. In Rose's case the attempt at removal of the ganglion was made by the transmaxillary route, which would preclude the possibility of a complete operation. In Keen's cases the Hartley-Krause method was employed, but the ganglion was not removed in its entirety, being only broken up and fragments scraped away. In Carson's and Tiffany's series of 208 cases there were 21 failures. In reviewing these, in but 6 cases was Carson satisfied that the ganglion had been removed completely. In 3 of these the pain was insignificant. In Friedrich's case the operation was complicated by an excess of hemorrhage necessitating tamponing of the wound twice. The ganglion, he claims, was removed completely. Pain returned immediately, but not so severe as before the operation. Four months afterward the pain was intense over the

entire area supplied by the nerve on the side of the operation. Later it extended to the opposite side as well.

Garré's case, previously referred to, is given as another example of recurrence after complete removal of the ganglion, although he states that sensation was retained over the area of distribution of the first and second divisions of the nerve. The part supplied by the third division alone was anesthetic. Pain returned most severe over the parts supplied by the second and third divisions. One and a quarter years after the ganglion was removed he reopened the skull at the site of the previous operation and found only a connective tissue thread passing into the foramen ovale and becoming lost on the dura. No ganglion tissue was found. The foramina ovale and rotundum were then closed by plugging with fragments of bone loosened from their borders by means of a chisel. Pain recurred after fifteen months. The patient was subjected to several peripheral operations, which ultimately gave relief from the pain.

In our third case there was a recurrence of pain of slight degree compared with that experienced before the operation. Immediately following the operation the region supplied by the first division was not completely anesthetic; the parts supplied by the second and third divisions were absolutely anesthetic. After two years the anesthesia remained practically as complete as it was immediately after the operation. At this time the patient complained of pain just below and behind the orbit, although pressure over the infraorbital foramen did not cause pain. The skin in this region was totally anesthetic. The ganglion tissue removed in this case was examined by Dr. M. Hertzog, who found but slight evidence of change from the normal in the ganglion tissue. The patient, when examined two or three years after the operation, was decidedly neurasthenic and seemed to suffer more from dread of recur-

rence of the former pain than from the actual conditions existing.

From the cases here reviewed and from our own experience it seems possible to have a return of the pain after removal of the ganglion. Nevertheless, we believe, with Cushing, that "the probability of non-recurrence bears a direct relation to the degree of entirety with which the ganglion has been removed." In our own cases we had each ganglion subjected to a careful examination by a competent microscopist. In all of the specimens submitted ganglion elements were found and the gross anatomic characteristics of the organ were preserved.

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DISCUSSION.

DR. JOHN B. MURPHY, Chicago—I have nothing new to add to this subject. The results of Dr. Halstead are about the same as mine. In my twelve cases of removal of the Gasserian ganglion I have had four deaths, and that is what caused me to abandon the operation. I feel that an operation for a lesion which of itself does not hazard the patient's life, that has a mortality, as it had in my cases, of 33 per cent., is a mighty serious undertaking, and for that reason I have given up the removal of the Gasserian ganglion in these cases for the injection of osmic acid for the relief of pain. Since my last paper I have had one recurrence of neuralgia from the injection of osmic acid. That was not a case of the class which is referred to in the paper. In those cases in which the injections of osmic acid are made into trunks that have once been removed and have regenerated the results are not as lasting as in the others, and I have advised against injections in this class. In the entire number up to date, except in the cases not previously injected, I have not had a recurrence. In one of them there was an attack of pain, and I believed it was a recurrence. I, therefore, sent for the patient, had her brought to Chicago, and found there was necrosis of the trunk of the nerve, the communication to the surface being closed, and this producing pressure in the inferior dental tract. On opening the inferior dental tract I took out a large fragment of dead nerve and some pus. The patient was immediately relieved, the same as from a hypodermic injection of morphin. There was primary union, and the patient left for home and has had no recurrence.

The Gasserian ganglion removal, in its entirety, is the only operation we are justified in stating is an absolute cure for the condition. In all of my cases that have survived the operation the cure has been perfect. I hope, from the injections of osmic acid, we will get at least three or four years' relief, and in Bennett's case we have a record of seven years' relief from this

simple and absolutely free from danger type of treatment.

I want to say that I do not think the deaths in Dr. Halstead's cases can be attributed strictly to the operation itself; but the same was true in mine. The fact, nevertheless, remains that these patients die after the operation, and that was my principal reason for abandoning it.

Dr. Charles H. Mayo, Rochester, Minn.—I would like to report an interesting case in connection with this subject of the removal of the Gasserian ganglion. In this work sometimes one thinks there is only one nerve or branch involved, and he feels that he is hardly justified in making a serious operation. And I will say right here that, while I once ran toward operations of this kind, I would run away from them now if I could.

Eight years ago I operated on a physician who had neuralgia of the infraorbital nerve. At this time, or a little before it, Sick came out with his silver screw and plate for fractures. I operated, took out a portion of the nerve, and inserted this screw and screwed it into the foramen, and for seven years he remained absolutely well. There was no possibility for the nerve to escape, and the screw remained in without causing a particle of trouble. At the end of seven years there was a recurrence of sensation, not of pain, but a little sensation appeared over the region where he had previously had pain. Later there were a few slight twinges. After another six months, fearing a recurrence of the former trouble, he came back to me, and I injected osmic acid merely into the area in which he had felt sensations, and within a few weeks thereafter he wrote me that the area was again entirely numb, as it had been for seven years. The screw has produced absolute occlusion of the canal, preventing the nerve from again escaping.

Dr. Halstead (closing the discussion)—I did not read my paper in full. I have in it a discussion of the pathology and regeneration of nerves after peripheral operations. It is a well-known fact, best illustrated by the case cited by Garré, one operated on by Madelung, that, after resecting or removing the infundibular branch of the fifth nerve, regeneration was complete at the end of eight months. And that has happened to

many surgeons. There is no question but what these nerves regenerate rapidly.

With reference to the osmic-acid treatment mentioned by Dr. Murphy, I think he is the only man in this country who has employed it at all extensively, as well as practically, excepting possibly Spiller, who suggested, in a discussion last year at a meeting of the American Medical Association, that hardening of the nerve tissue from the use of osmic acid would prolong the time of freedom from pain and regeneration would not be so rapid. I am not a strong advocate of the operation of removing the Gasserian ganglion, yet it is our only hope of cure, or that of resection of the sensory root, that we have in these cases of long-standing facial neuralgia. I would not think of operating on a patient who had had the disease for a short time, or where the disease was limited to one division of the nerve. Where all three divisions are involved and the disease has existed for from seven to twenty years it seems to me any operation is justifiable.

I was unfortunate in having a high death rate, as most men do in reporting these cases, but in two of them I may say death was accidental. Uremia might occur in any case. The third one is an unique case, so far as I can find, and I can honestly say, the postmortem having been made by a very efficient pathologist, that the infection was not carried into the cranial cavity at the time of the operation, but it was due to an old sphenoidal empyema. It is a well-known fact that the bony walls of the sphenoidal sinus may be absent; there may be a congenital defect in the wall, as there frequently is. In this case it was not apparent that there was any congenital defect, but several pieces of bone had necrosed and had an irregular, eaten-out appearance, which would give the idea of an old necrosis, simply a layer of granulation tissue guarding the cranial cavity, the same as would happen in mastoid disease.

SURGICAL DISEASES OF THE PANCREAS.

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OTTUMWA, IOWA.

We who received our preliminary medical education a quarter of a century or more ago were taught that the functions of the pancreas were to emulsify fat, digest starch, and break up the bundles of muscular fibers.

About twenty-five years ago we were informed by Langerhans and others that, besides the ordinary structure, i. e., the true glandular structure, there were scattered through the lobules tufts of peculiarly arranged cells, richly supplied by blood vessels which secreted one of the several "internal secretions" that are absolutely necessary for animal existence; these little islands of cells scattered through the organs were named the "islands of Langerhans."

Then we learned that the pancreas had a double function, either one absolutely essential. Shortly after this, about 1880, Balzar reported a series of cases of chronic inflammation of the pancreas, with a good description of fat necrosis, due to the action of the perverted function of the organ. Strange as it may seem, no notice was paid to this paper, and not till Fitz published his classical essay on acute and chronic pancreatitis, ten years later, did the profession seem to awaken to the importance of the subject.

This was followed by a flood of papers and discussions that have given us a rich literature on this most important but hitherto unexplored field; but the end is not yet, for there is still work for the pathologist and, above all, for the physiologic chemist to clear up many

obscure points and show us more of the character and use of the secretion produced by the "islands of Langerhans" and the relation their destruction bears to diabetes; to explain more definitely how inflammatory diseases of the organ produce such widely disseminated fat necrosis, how the fat-splitting principles escape into the tissues without any injury to the capsule of the pancreas; these and many other questions are to be settled before we can feel that the pathology of the pancreas has been completed.

Yet enough has been learned the past few years to show us that much of the undefined pathology in the upper part of the abdomen is due to the disorders of this important organ, instead of some gastric trouble, malaria, neuralgia or other indefinite "blanket of ignorance," as has been the custom in the past.

In a paper written years ago on pancreatic cysts I called attention to the fact that pancreatic cysts are almost always due to obstruction of the pancreatic duct by a stone in the ampulla of Vater. The same cause produces most of the other forms of pancreatic disease.

Repeated experiments show that if normal bile is forced into the pancreatic duct, an active pancreatitis rapidly supervenes, accompanied by fat necrosis; while if the bile used in the experiment be infected by almost any of the pus-producing germs, a virulent pancreatitis is developed, with extensive fat necrosis and rapid death.

Clinical observations have repeatedly shown that where pancreatic inflammation exists there is usually a stone so located that it obstructs the flow of bile into the intestine, thereby, by back pressure, forcing the fluid into the pancreatic duct; while if the stone is so located that it obstructs the flow of fluid out of the Wirsung's duct for any length of time a retention cyst results; stones impacted in the pancreatic duct produce the same results.

Senn, in 1888, published a series of experiments on

dogs, showing that total obstruction of the pancreatic duct caused atrophy or necrosis of the gland, while partial or intermittent obstruction resulted in retention cysts.

Conditions of this organ requiring surgical aid are: cancer, wounds, retention cysts, lithiasis and inflammatory diseases, the latter being divided into acute, subacute and chronic; while the last is subdivided into parenchymatous and interstitial; the interstitial hardening may be interlobular or interacinar.

Almost all cases of pancreatic cancer are produced by chronic cholelithiasis, i. e., the cancer begins in the bile duct, the result of a chronic irritation produced by the stone, and passes then into the head of the pancreas. Occasionally a stone lodged in the pancreatic duct causes cancer by the same process.

Such cases can not usually be diagnosed early enough to be amenable to surgical treatment, the early symptoms being but little different from those produced by other local diseases about the pyloris. but later a tumor develops and, with it, rapid emaciation and the fatty stools, symptoms that are pathognomonic of destructive disease of the pancreas.

In case the tail of the organ is destroyed by the cancerous process diabetes mellitus develops, but if any considerable number of the "islands of Langerhans" remain the patient will probably escape the saccharine urine.

The positive diagnosis carries with it the prognosis, for no treatment can stay the rapidly fatal course of the disease; palliative measures to relieve the pain are all we can do for the patient.

A few cases of trauma have been cured by operation, but only in penetrating wounds. A number of crushing injuries are reported, but all must almost of necessity prove fatal on account of the amount of force required to injure so well protected an organ.

The number of stab and bullet wounds of the organ

that recover are very small, for the reason the pancreatic fluid escaping into the abdomen results fatally by means of its chemicophysiologic action, as was illustrated in the tragic death of our late president, McKinley. Notwithstanding the unfavorable prognosis of pancreatic trauma, an examination should be made in all cases of injury in this region, with a view to repair such injury if it is found.

General surgical principles will govern the treatment of such accidents; bleeding should be stopped by carefully applied sutures if possible; if not, by gauze packing, and the lesser peritoneum walled off carefully by the same means. Free drainage is our most reliable means of protecting the tissues from the irritating fluid.

Pancreatic cysts have for years been a most interesting subject for pathologists and surgeons; caused, as Senn has shown, by partial obstruction to the flow of pancreatic fluid, we must look for their etiology in the ducts. The disease is the result of the obstruction of the pancreatic duct by a pancreatic stone, by adhesive bands which obstruct the flow of pancreatic fluid, by cancer or other tumor pressing on the duct, or, as is most often the case, a gallstone lodged in the ampulla of Vater which obstructs the flow from the pancreatic duct. Hence it is not strange that the symptoms of pancreatic cysts are usually preceded by one or more attacks of cholelithiasis.

The immediate symptoms are pain, with a sense of weight, pressure fullness in the epigastric region, followed sooner or later with a tumor, usually discovered first on a level with and a little to the left of the pyloris; in time the tumor is observed to be cystic.

A cystic tumor in the left and central epigastrium must be either a cystic left kidney, ascites in the lesser peritoneum, echinococcus cyst of the left lobe of the liver, or pancreatic cyst; and the diagnosis must be made by exclusion. In the pancreatic cyst, if the colon

and stomach be distended with gas, the tumor will be above the colon and below the distended stomach.

Formerly we were taught to aspirate the tumors for diagnostic purposes, but we now know that this is a dangerous and useless practice. A tumor in the abdomen, if it needs any surgery at all, needs a free incision, for an escape of pancreatic fluid in the abdominal cavity, as may occur in the aspirating, would almost necessarily be fatal.

The usual point of attack is in the median line or slightly to the left between the ensiform and the umbilicus, over the most prominent part of the tumor. After opening the peritoneum, we may be fortunate enough to find the tumor firmly adherent to the peritoneal walls; if so, it should be incised and a large drainage tube inserted, the surface covered by some protecting material to prevent digestion of the skin by the fluid; in case the tumor is not adherent, an opening must be made through the omentum into the lesser peritoneum and the tumor examined.

Now we may complete the operation by carefully stitching the tumor to the periosteum and opening and draining it at once, or, by far the safer method, of fixing the sac to the peritoneum and waiting two or three days for firm adhesions, before opening and draining, for it will not do to contaminate the abdominal cavity by the acrid, dangerous fluid. The second operation can be done without an anesthetic.

Free drainage should be continued as long as necessary, but if pancreatic fluid continues to escape for months the free abdominal cavity should be opened and the obstructing stone removed; when we may hope that the fluid will be diverted through its normal channel.

It has been my fortune to have operated on three cases of pancreatic cysts, and, as there are some peculiarities about each case, I will give a brief history of them.

CASE 1.—D. F. B., aged 41, was attacked Jan. 12, 1893, with his old-time enemy, bilious colic. The usual remedies made the pain bearable, but it was several days before he could do without full doses of anodyne; after this he complained bitterly of severe pain extending across the left side. By the end of three weeks, from the undefined fullness of left hypochondrium, a tumor could be outlined; it increased rapidly in size and the pain in intensity.

February 13, recognizing the cystic character of the tumor, and with the advice of my associates in the case, we drew off with small needle fourteen ounces of thin, turbid, pea-soup looking fluid, which on examination proved to be pancreatic fluid. The next day we opened in the median line down on the tumor which was, fortunately, firmly adherent to the abdominal walls, incised the sac, and let out about five pints of the same kind of fluid, packed the cavity with gauze, closed up ends of incision and applied generous dressing. For several days the discharge was very free, soaking everything and causing excoriation wherever it touched the unprotected skin. By March 28 the cavity had closed and the drainage ceased. The pain that had been so distressing ceased after opening the cyst; but within a week after the drainage stopped he began complaining of a recurrence of the pain, and within a week a noticeable fullness showed a recurrence of the trouble. April 9, on the advice and with the assistance of Dr. N. Senn, we again opened and drained the sac, using this time large rubber tubes. For two or three weeks the drainage was quite free, but then gradually settled down to one and a half to two ounces per day; but our patient lost ground rapidly, notwithstanding he had an enormous appetite and was free from pain. He ran down from 175 to less than 100 pounds. Then he began to slowly improve, so that by May 27 he was able to go to his old home in Southern Illinois.

During the next two years he wrote me that he had

regained his weight; that he was still wearing the tube; the discharge was about as when he left.

In April, 1895, while in St. Louis, I had him come and see me. Found him in good general health, still wearing a large tube, with no evidence of disease except a sinus irritated by the tube. I replaced the tube with a very small soft one, which I advised him to abandon in two weeks, assuring him that the wound would heal if the tube was left out.

June 25 he was greatly alarmed by finding, on arising in the morning, that the supper of the previous night was in the dressing of the wound. He made a hasty trip to Ottumwa to see me. I found dressings soaked with bile-stained food. The sinus contained a large hard tube which had eroded the duodenum near the opening of the bile duct. Had him taken to the hospital, removed the tube, applied gauze and cotton pad, ordered rectal nutrition and nothing by the stomach except sterilized water; most of the water was discharged promptly on the dressings for the first few days. In ten days all discharge ceased and he returned to ordinary diet.

I am of the opinion that the case would have been cured two years earlier by proper care in removing tube, as the cavity became obliterate.

Case 2.—Dec. 24, 1897, was called to Williamsburg by Dr. Moon to see Mrs T., aged 44, with the following history: Patient was a large, fat woman, weighing about 250 pounds. Ten days before had been confined by an easy labor. For four or five weeks before the labor she had severe pains in left side under ribs; and for two weeks had daily chills, supposed by patient to be due to the pain. After the confinement, doctor discovered a large, hard tumor, about the size of pregnant uterus at term, in left hypochondrium, very tender. After the exhibition of large doses of saline, she passed an enormous amount of fecal matter of very bad odor. Within three days she passed two or three gallons of

hard, fecal lumps, which reduced size of tumor. From time of her confinement till I saw her she had constant temperature; surface clammy and dusky; mild delirium; a typical picture of sepsis.

Tumor extending from ribs to crest of ilium across four inches, past median line. very hard, too tender for more than gentle palpation. Profuse, foul smelling discharge from uterus, which organ was very much relaxed and filled with stinking clots.

Dr. Moon had removed several ounces of such clots in the morning. We again cleaned out two or three ounces of the most offensive stuff and packed uterus with iodoform gauze; advised continuation of strychnia, quinin and stimulants she had been taking, with forced feeding and daily repacking uterus.

I believed she was suffering from malignant disease of the pancreas, with sepsis from uterine inertia, that allowed clots to decompose.

Prognosis in accordance with diagnosis.

January 12 was recalled; patient's general condition much the same, only the uterus was smaller and firmer; no odor nor clots. Tumor larger and more painful and plainly fluctuating. Made free incision in the left loin to sac, the walls of which were stitched to abdominal wall and incised, evacuating twelve to fifteen pounds of dirty brown, purulent, bad-smelling matter, mixed with a large amount of necrotic tissue. The large cavity was hastily wiped out, packed with gauze, and the patient returned to bed in bad condition.

Part of the gauze was removed in two days, the balance in four, and cavity repacked; temperature reduced, appetite returned, and general condition improved, except decline in weight. In less than three weeks patient was able to sit up several hours a day.

February 5 was again recalled on account of swelling in the right side. Found fluctuating tumor below the liver, to right of center; very tender. Wound from former operation closed, except small sinus two inches

deep. Patient had lost weight very rapidly since the last operation; fully 100 pounds in less than four weeks, although the appetite had been fairly good; skin hung in folds; pulse 160 and very weak; mind dull and wandering. Incised cyst and drained about a quart of what appeared to be acetic fluid in a cavity bounded by liver and peritoneum, including gall bladder. Patient's condition too grave to allow extensive exploration. She sank gradually and died three days after the last operation. Autopsy next day; found small sinus from first operation leading down to pancreatic region, but no pancreatic tissue existed. Several stones in the common duct and a great number in the gall bladder. Cavity opened at the last operation; encysted peritonitis, probably due to cholecystitis.

At this time we learned that our patient had been subject for years from cramp colic in the right side; bilious colic.

In looking back over the case, it is probable originally we had a simple pancreatic cyst, due to gallstones blocking the common duct above, and a pregnant uterus below; between these a large fecal accumulation occurred, from which the adjacent cyst became infected, and we had the very rare occurrence of a suppurating cyst of the pancreas.

Case 3.—J. M. C., 57 years, male. Entered the hospital May 2, 1902, on account of a large cyst in upper left aspect of the abdomen; greatly emaciated and suffering intense pain; diagnosis, pancreatic cyst probably due to cancer. Next day I drained the cyst, through anterior incision, of about sixteen pints of pancreatic fluid and necrotic tissue. The cyst was firmly bound to the peritoneal walls; cyst walls thick and rigid; was unable to make out condition of any of the abdominal organs through the incision; could only feel mass back of sac; placed large drainage tube, and closed the balance of the incision.

Condition improved for a while on account of reliev-

ing the pressure; appetite returned, but emaciation progressed rapidly, and he died May 19 of inanition. No postmortem was allowed. This was evidently a case of cancer of head of the pancreas, with resulting retention cyst.

INFLAMMATORY DISEASES.

The symptoms of acute pancreatitis are severe sudden pains in the upper part of the abdomen, with vomiting, accompanied by profound shock, which is rapidly followed by collapse and frequently by death in from two to four days. The pain and vomiting closely simulate acute obstruction or violent gastritis.

I am of the opinion that most of the cases of so-called gastritis that prove rapidly fatal are due really to pancreatitis, and if all deaths following obscure abdominal conditions were carefully examined at autopsy many more deaths would be reported from pancreatic diseases and less from obstruction, gastritis, congestive chills, etc.

Given a person with a history of repeated attacks of pain and tenderness in the upper abdomen with or without jaundice, who is seized with severe pain above the umbilicus, vomiting, pallor and shock, which passes into collapse, should be examined with the possibility of pancreatic disease in mind. in fact, such symptoms must mean either acute infection of the pancreas, gangrenous colangitis, perforation of the stomach or intestine or acute obstruction; and not in a few cases it will be absolutely impossible to make a differential diagnosis from the outside during the first 24 or 36 hours, but in a short time, unless the patient is quite fat or muscular, under an anesthetic, an indefinite mass may be felt in the epigastrium, extending to the left. The fever is not always the same; at times high, but more often only one or two degrees above the normal and not infrequently subnormal. The pulse is always weak, rapid and soon becomes thready; in fact, here, as in almost all other serious intra-abdominal pathology,

the pulse and facial expression are far more reliable symptoms on which to base a prognosis than are the temperature and pain.

The course and symptoms of the chronic type of the inflammation is much like the foregoing, except of a milder character. The onset is more gradual, pain dull and throbbing, fever of an intermittent type, not infrequently accompanied by chills; tenderness marked from just below the ensiform cartilage, extending thence to the left, under the ribs. In these subjects a boggy swelling can be made out in most cases, tenderness over the gall bladder, and in many of the cases jaundice due to obstruction of the common duct; for, as stated before, most cases of pancreatic infection occur from the bile tract.

Many cases of chronic indigestion, of intermittent fever, of indefinite pathology, that extend over months, and even years, better for a while and then worse, but usually causing discomfort in the gastric region, cases that never have a definite or permanent diagnosis made, are, we know now, due to chronic or recurring pancreatitis of a low form; i. e., cases in which the infecting material is not virulent and in which the obstructing stone in the ampulla does not constantly dam bile back into the pancreatic duct.

These chronic cases run a very indefinite course as to severity as well as duration. Many cases entirely recover in a few weeks or months; many more get much better until the ball valve acting stone, in the end of the common duct, again diverts the bile into the pancreas; but here, as in infected gall bladder or appendicitis after one or more attacks, the trouble is likely to recur repeatedly till either the cause of the trouble is removed or the patient dies from an acute attack.

The severity and character of the inflammation of the pancreas is governed entirely by the type of infection; by experiments on animals we have learned that the injection of any kind of bile into the pancreatic duct

causes pancreatitis; aseptic bile, a low form of inflammation, while infected bile causes a severe form; cultures of pus-producing cocci always produce a severe type of inflammation and fat necrosis, frequently resulting in necrosis of the entire organ, and always by speedy death of the animal.

Time will not permit us to go to any extent into the pathology of this most interesting condition, much as we would like to; but we can not refrain from calling attention to the severity of the character of some cases of infection.

The rich blood supplies the thin walls of the blood vessels and accounts for the extensive extravasation of blood in the so-called hemorrhagic pancreatitis. In these cases, within a few hours from the onset of the trouble, the pancreas is filled to its limit with extravasated blood, and soon the capsule gives way, and the bloody serum exudes into the lesser peritoneum and thence into the general abdominal cavity, so that in doing a section the contents of the peritoneum is stained with bloody fluid, as in acute obstruction due to strangulation. In many of these cases the blood pressure is so great that it produces complete necrosis of the organ.

Not infrequently at autopsy we find the entire organ has been destroyed by strangulation, due to the extravasated blood. I saw such a case some time ago, in which the lesser peritoneum was filled with clotted blood and necrotic tissue; no remnant of glandular tissue could be discovered by macroscopic examination.

Robson advances the theory that probably the hemorrhagic form is due to the glycerin formed in the tissue by the action of the pancreatic fluid on the surrounding fat.

In the subacute or chronic varieties of the disease we find that where the disease is located in the outer end of the organ and destroys the islands of Langerhans, the condition is always accompanied by diabetes; but if any of the groups of cells are functionating the glu-

cose urea does not obtain; on the other hand, if the parenchymatous structure is destroyed, the patient rapidly loses flesh, because of the absence of this important digestive ferment.

At times we find at autopsy that almost every particle of the pancreas has been destroyed either by chronic inflammatory changes or by cancer, and yet the patient has not suffered from diabetes. In such cases closer investigation will always discover that some of the intralobular tissue has escaped.

When the disease is located in the true secreting structure, i. e., in the parenchyma of the organ, we have an absence of pancreatic fluid, and consequently the defective nutrition that must of necessity follow the loss of this digester; the starch is passed undigested, fats are not emulsified, but thrown off as oil; meat is not disintegrated, but the bundles of fibers pass from the bowels unbroken, so but little of the food is assimilated, and a most rapid emaciation results.

When the destructive process is confined to the intra-acinar tissue, i. e., to the islands of Langerhans, we have an absence of the unknown "internal secretion" that presides over the excretion of sugar by the kidneys, and we have a case of diabetes mellites on our hands.

The treatment of the very acute variety of the hemorrhagic type is usually of no avail, as collapse occurs so rapidly that there is no time for surgery, even if a diagnosis had been made; but on opening the abdomen, if we find this condition, we should drain the bloody serum either through an anterior opening, or, better, through a carefully made stab wound through the left loin, and open and drain the bile canal, all as rapidly as possible, as our patient will not stand chronic surgery.

In the subacute and chronic cases, the treatment consists in free drainage of the gall bladder, with the removal of all obstructions in the bile ducts. Such drainage should be maintained till all signs of infec-

tion have subsided and healthy bile only is discharged.

This résumé of the subject has, of necessity, been very brief, but I hope it may induce some of my hearers to read carefully the comprehensive treatises of Opie or Robson, or the valuable papers of Park, Deaver, Fitz or others on diseases of the pancreas, and thereby learn all possible concerning the physiology and pathology of this most important organ.

CYSTS OF THE PANCREAS.

D. W. BASHAM, M.D.
WICHITA, KAN.

Cystic disease of the pancreas is a rare affection. Its pathogenesis is still veiled in obscurity. But little progress has been made in the study of this disease during the last decade. It is remarkable to note that the chapter on "Cysts of the Pancreas" in Greig Smith's first work on abdominal surgery conveys about the same information as that we find in our most recent work on the subject.

Pancreatic cysts occur most frequently in the male sex and in middle life. A short reference to the physiologic anatomy of the gland may help to elucidate the principles underlying the formation of a cyst of that organ.

The gland is composed of a system of tubules originating in alveoli and tending toward the main duct. The inner layer of the membrana propria is constituted of fibrillar tissue, which supports two layers of cells which are intimately concerned in the secretion of the pancreatic fluid. The inner of these two layers is granular, and almost disappears during the process of digestion, but is rapidly replaced by the deeper layer.

It is evident that this continuous, rapid and complete metamorphosis of cells must often be attended by accidents which tend to obstruction of the tubules, and thus facilitate the development of cysts. It is, perhaps, herein that the changes in the secretion may be wrought which Professor Senn believes necessary to the formation of a cyst.

Obstruction of the main duct or some of its considerable branches is the preliminary step in the growth of a pancreatic cyst.

In very many instances the cyst exists as an accident secondary to some infection in and about the head of the pancreas. Thus, carcinoma in the head of the organ, connective tissue changes resulting from inflammation, and cicatricial formations after injuries may constrict the excretory duct and give rise to a cyst. Catarrhal inflammation extending from the duodenum into the excretory duct may cause its closure, and is reckoned by some among the etiologic factors of cysts. Tumors of the duct, contracting peritoneal bands and impacted gallstones are given as the most frequent causes of closure of the excretory channel.

Malignant neoplasm situated in the pyloric region of the stomach may give origin to perigastritis, which may interfere with the lumen of the duct, or, if the growth attain considerable size, direct pressure might be exerted sufficient to cause the same effect.

An ulcer in the duodenum deep enough to cause periduodenitis may exert an etiologic influence in the history of a cyst. The fact that so many of these cases fail to improve after operation would lead one to believe that cystic formations in the pancreas are but secondary results of some graver trouble in the head of the organ or some adjacent organ. These cysts are of slow growth, excepting when caused by an injury, when the development is sometimes very rapid.

The tail is by far the most frequent site of the cystic formation. The contents of a cyst are extremely variable in character, sometimes consisting of pancreatic fluid, sometimes of serum, which may be blood stained. Hemorrhagic cysts often contain granular globules in abundance. Some one has suggested that the admixture of the blood elements may be due to the digestive action of the pancreatic juice.

Symptomatology.—Serious digestive disturbances are

among the most constant manifestations of cystic disease of the pancreas. Anorexia, diarrhea, nausea and vomiting are often present. Sometimes there is constipation. Bloody stools have been observed in the course of the disease. Pain in the epigastrium and cardiac palpitation are usually present. There is sometimes a peculiar hue of the skin, which has been spoken of as earthy in appearance. The mucous membrane is often anemic.

Pancreatic cysts vary in size from a minute point to the capacity of three or four liters.

The diagnosis is a matter of exceeding difficulty and great uncertainty when the growth is too small to permit of palpation. If the cyst has attained sufficient volume to be outlined by palpation, the diagnosis may be made with much precision. If the growth has been allowed to attain great size, its differentiation from growths involving other intra-abdominal organs becomes a matter of great uncertainty. The pancreatic cyst of moderate size may present in the median line just above or below the umbilicus. The colon may be displaced downward into the pelvis. The stomach may be carried upward against the diaphragm. Adhesions are usually extensive, especially if the growth has been slow.

The treatment may be summed up in a few words. Medical treatment is of no use. Gussenbaur was the first to marsupialize the sac, and since then this has been the favorite procedure with most surgeons. The only question regarding this method is whether to attach the sac to the abdomen and incise at once, or to operate a *deux temps*. If there is plenty of time and the cyst is not so large that a day or two might make any difference in the result, it is better to operate in two stages, stitching the sac to the peritoneum and muscles, and opening two or three days later. Excision of the sac is not often practical, but may sometimes be attempted. Often such a course would expose the pa-

tient to the risk of contaminating the peritoneal cavity with the pancreatic secretions.

CASE.—Mrs. B., widow, aged 62 years, German by birth, housewife, accustomed to outdoor as well as indoor labor. She was emaciated, skin was white and waxy, suffered from constipation and severe pains in the abdomen. She had procidentia uteri, difficult digestion; had noticed the presence of the tumor for about four years. The tumor presented in the median line, above as well as below the umbilicus, and had attained the size of a man's head. At the operation, which took place at the St. Francis Hospital in Wichita, Kan., Aug. 3, 1904, a cystic tumor was found which filled the abdominal cavity. The colon was displaced downward into the pelvis and was strongly adherent to the walls of the cyst.

On breaking up the adhesions to the viscera, a broad, flat pedicle was found to be attached along the lower border of the tail and body of the pancreas. The pedicle was as thick as the hand and must have contained considerable pancreatic tissue. The tumor was brought into the wound and packed around with plain sterile gauze. In disrupting the adhesions between the intestines and walls of the tumor the latter were left very thin in places, and bursted about the time the walling off of the peritoneal cavity with gauze was completed, and very nearly a gallon of coffee-colored fluid was discharged. Examination of the inner surface of the tumor walls disclosed a sacculated condition. The sacculations were more numerous at the base of the tumor.

Having emptied the sac, it was brought into the most advantageous situation in the wound and fixed by a circular row of continuous catgut sutures, and a rubber drainage wrapped about with gauze was carried to the bottom of the sac and allowed to protrude. The uterus, which, as before stated, was completely prolapsed, was now brought into the lower angle of the wound and

fixed with silk sutures. The wound was then closed with through-and-through silkworm gut, and a mammoth dressing applied.

The case went on to convalescence without accident, save occasional attacks of pain, which sometimes required the use of small doses of morphia. The rubber tube was removed about the eighth day, the gauze the twelfth day, after which a small rubber tube constituted the only drainage until about the fifth week, when it was discontinued entirely. The patient left the hospital at the end of seven weeks, and I have not seen her since.

This woman's dyspeptic manifestations were better after the operation than before, but seemed not to be relieved entirely, and about the first of December she began to have serious trouble with her stomach and called a physician, who was able to outline a tumor in the region of the pylorus, which he diagnosed as cancer of the stomach.

DISCUSSION ON PAPERS OF DRS. BROCKMAN AND BASHAM.

Dr. W. D. Haggard, Nashville, Tenn.—I thank you for asking me to open the discussion on this subject. I have nothing in particular to say, except to express my sense of enjoyment and appreciation of the two papers that have touched on cysts of the pancreas. It seems that our knowledge on this subject is about crystallized; but there still remain some cases which present individual features which may be discussed with interest and profit. In reference to inflammation of the pancreas, which was alluded to in the first paper, I think that subject just now occupies a most prominent position for the future surgical development. It is closely allied to the lines of discussion of this morning's paper of the surgery of the upper abdomen. When we stop to think that our knowledge has been so much amplified in the last two years relative to this sequestered organ, and when we consider, as said by one of the essayists, that many of the so-called sudden deaths due to gastritis, intestinal obstruction, and the like, are, after all, probably cases of pancreatitis, it makes us realize that our

lesson has simply been appreciated, but not yet mastered, and that the diagnosis of this lesion, as of other lesions, will remain difficult problems, but ones to which we should address ourselves earnestly and thoughtfully.

There are three types of infection—acute, subacute and chronic. They differ as widely as do the diseases, not only in their causation, but in their progress, pathology and treatment. Opie has done excellent work in regard to infection of the pancreas in the acute cases; and Mayo Robson has called our attention to chronic inflammation of the pancreas due to gallstones. Cases of enlargement of the head of the pancreas, supposedly cancer, have turned out to be cases of chronic pancreatitis, which might have been saved by operation at that time by drainage of the gall bladder, and in that way indirectly draining the pancreas and the infection which caused the chronic inflammation.

Dr. R. C. Coffey, Portland, Oregon—I have a drawing of an interesting case which I expect to show tomorrow in connection with my paper on gastroptosis. The case was diagnosed as one of ovarian cyst, which was so firmly wedged in the pelvis that it had drawn the stomach and large intestine into the pelvis. I may say, too, that I also made a mistake in diagnosis, as it had given no symptoms. I opened the abdomen, with the understanding that I was going to remove an ovarian cyst. I found later, however, that it was a malignant growth. The vessels were enlarged to the size of a lead pencil, and, after lifting the tumor up out of the pelvis and attempting to remove it, I encountered some trouble, and later found that it was between the layers of the mesentery and the colon. So I slit the posterior layers of the transverse mesocolon, lifted the entire tumor, and, while my assistant constricted the mesentery of the large intestine, I enucleated it. I then found that it came evidently from some portion of the pancreas, and it had separated the two layers of the transverse mesocolon. The tumor was not difficult to remove, and its attachment was not as firm to the pancreas as it seemed. But this tumor had drawn the stomach down so that its upper border was below the umbilicus. The operation was completed by quilting the two layers of the mesentery from below up to the colon, and then the hole, which was accidentally torn in the gastrocolic omentum, was also repaired, and the

omentum stitched to the abdominal wall to prevent adhesions below. The patient left the hospital in a couple of weeks. I do not know, but I expect the disease will return, and that eventually the patient will die from malignant growth, as the pathologic report was that of questionable adenosarcoma.

DR. BROCKMAN (closing the discussion)—On account of time limit, I left out what I consider the best part of the paper, namely, that part which dealt with chronic pancreatitis. In reading it I tried to condense the subject-matter as much as possible.

Reverting to the subject of pancreatic cysts, I am of the opinion that these cysts are not so uncommon as we have hitherto supposed. I have had four of these cases in the last twelve or fourteen years. In one of them I made a diagnosis of cyst in the region of the pancreas, with a large solid tumor outside of it. At the patient's house, about ten years ago, I made an exploration, and cut down onto a very large spleen. The blood vessels were so large and the patient was in such a bad condition that I did not remove anything. The spleen was densely adherent to the parietal wall. The patient lived 9 years, and then died from enlargement of the spleen. At the postmortem examination we found a pancreatic cyst, with about seven or eight pints of fluid in it.

The most important part of this subject is the recurring attacks of chronic pancreatitis, which we call neuralgia of the stomach and by other names that mean nothing, and were we to cut down on to the bile tracts and remove stones we would cure patients and save them from death later on from acute attacks. I believe that chronic pancreatitis in its symptomatology and pathology is similar to chronic appendicitis and needs as prompt surgery as recurrent appendicitis.

EXCISION OF ELBOW JOINT FOR TRAUMATIC AND ARTHRITIC ANKYLOSIS.

B. MERRILL RICKETTS, PH.B., M.D.
CINCINNATI, OHIO.

Culbertson, in his prize essay (A. M. A., 1876) gives three classifications for excision of the elbow joint:

1. Gunshot injuries, 598 operations, from 1781-1871. Hospital mortality, 20.95 per 100. Private practice, no deaths.

2. Disease, injuries and deformity, 477 operations, from 1758-1872.

3. Fragments of bone, 7 operations, from 1777-1863.

The province of this paper, however, is only to consider the following conditions:

1. Ankylosis of the elbow joint, due to acute or chronic suppurative synovitis without injury or destruction of bone, of which he mentions but 26, 7 right, 5 left, and 14 not stated.

2. Ankylosis of the elbow joint, due to acute or chronic non-tubercular synovitis without injury or destruction of bone, of which he mentions 86, 18 right, 15 left, and 53 not stated.

3. Ankylosis of the elbow joint, due to fracture of the articulating surfaces of the bones entering into the formation of the joint.

Excision of the elbow joint for diseases, injuries and deformities. Results:

Mobility	128
Partial mobility	142
Ankylosis	33
Amputation	25
Flail joint	5
Not stated	144
	477

Injuries, 22.22 per 100 died in hospital. Private practice, 26.66 per 100 died.

Disease, 11.73 per 100 died in hospital; none in private practice.

Injury and disease (not gunshot), 12.61 per 100 died in hospitals. Private practice, 12.05 per 100 died.

Excision of elbow joint for gunshot injuries. Results:

Mobility	54
Partial mobility	25
Amputation	20
Ankylosis	22
Flail joint	3
Not stated	474
	598

Gunshot.—Hospital excision, 20.95 in 100 died, while in private practice there were no deaths.

Removal of fragments of bone. Results:

Motion	2
Partial	1
Ankylosis	3
Not stated	1
	7

Complications.—(1) Hemorrhage, (2) gangrene, (3) paralysis, (4) pain, (5) flail.

Functions Desired.—Rotation, supination, flexion, extension.

Ollier's letter to Verneuil gave the latter the credit of being the first to make a subscapuloperiosteal resection (1859). This was the first recorded operation of the kind ever made. And for this Ollier dedicated his treatise on resections to Verneuil, with the remark, "My work is but the development of the ideas propagated by Verneuil in that operation."

Antyllus said that if a fistula forms between an articulation, and has impaired the extremities of the two bones and separated them from one another, the end of either of the bones must be taken out (probably meaning necrosis).

Wainman, of Shripton, England, 1758, was the first

to excise the elbow joint (complicated and irreducible luxation) for any cause.

Gurdon Buck, 1842, made the first excision in America for traumatic ankylosis. Joseph Pancoast, during the same year, did a complete excision for disease, and



Fig. 1.—Case 1. Miss ————————, age 22 years. Seven years after excision of elbow joint for ankylosis resulting from fracture (extended).

Hoyt, 1847, during the Mexican war, at Jalapa, one for gunshot wound of the elbow.

Ollier gives seven classes of resection: (1) Resection for traumatic lesions, (2) resection for inflammatory lesions, (3) resection for organic lesions, (4)

orthopedic resections, (5) preliminary resections, (6) temporary resections, (7) osteoplastic resections.

1. Partial excision, one or two bones.

2. Complete excision, all articulating surfaces. No mortality for deformity (?). Mortality about the same in partial and complete excision.



Fig. 2.—Case 1. Miss ————————, age 22 years. Seven years after excision of elbow joint for ankylosis resulting from fracture (flexed).

3. Extraperiostic, resection without preservation of the periosteum.

4. Disphysiary resection, bony resections.

5. Resections for inflammatory lesions, such as are done antifibril, intrafibril and postfibril.

Cartilaginous Resection.—(1) Temporary cartilages, (2) permanent cartilages, (3) conjunctive cartilages.

Some one has said that one should abandon that which is good for that which is better. Surgeons, in general, should distinctly have the credit for so doing.

Excision of the elbow should be made in children only when ankylosis is incomplete. If ankylosis is complete, excision of elbow should not be made before the age of 15 years. If incomplete, disarticulation may be made

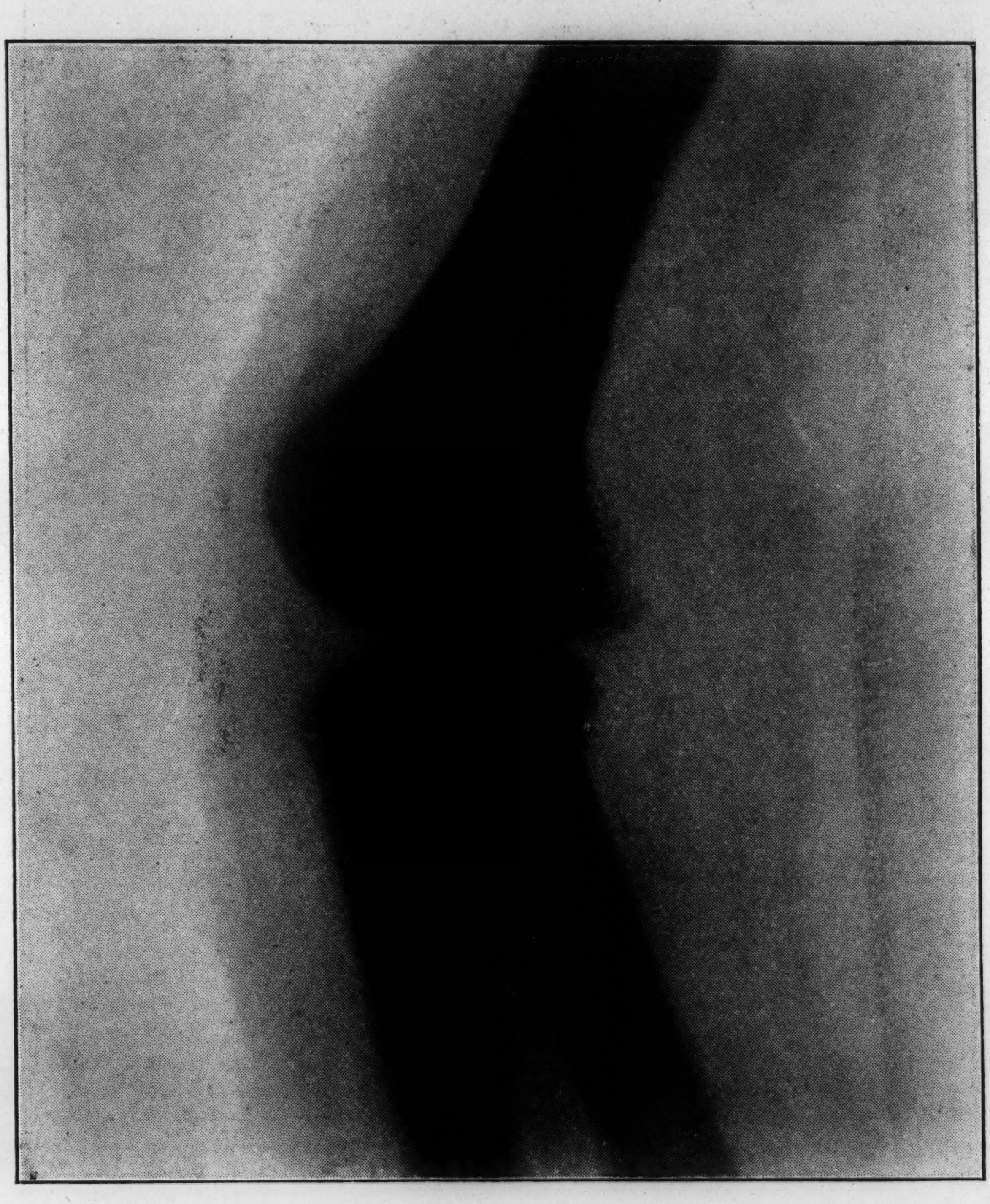


Fig. 3.—Case 2. Miss H., five months after excision.

and only the articulating surfaces of the bones removed without injury to the epiphyseal growth, which could not be well done if ankylosis is complete.

Ollier, who made 141 resections before antiseptics, says that in animals ankylosis does not take place after excision of joints, probably due to continual motion.

He also says that the absence of articulation between bones whose extremities have been resected is due to not preserving the periostiocapsulary sheath, and that the result is a useless and pendant limb.

CASE 1.—Ankylosis due to trauma. Miss P., aged 21 years, fractured the right olecranon and the head of

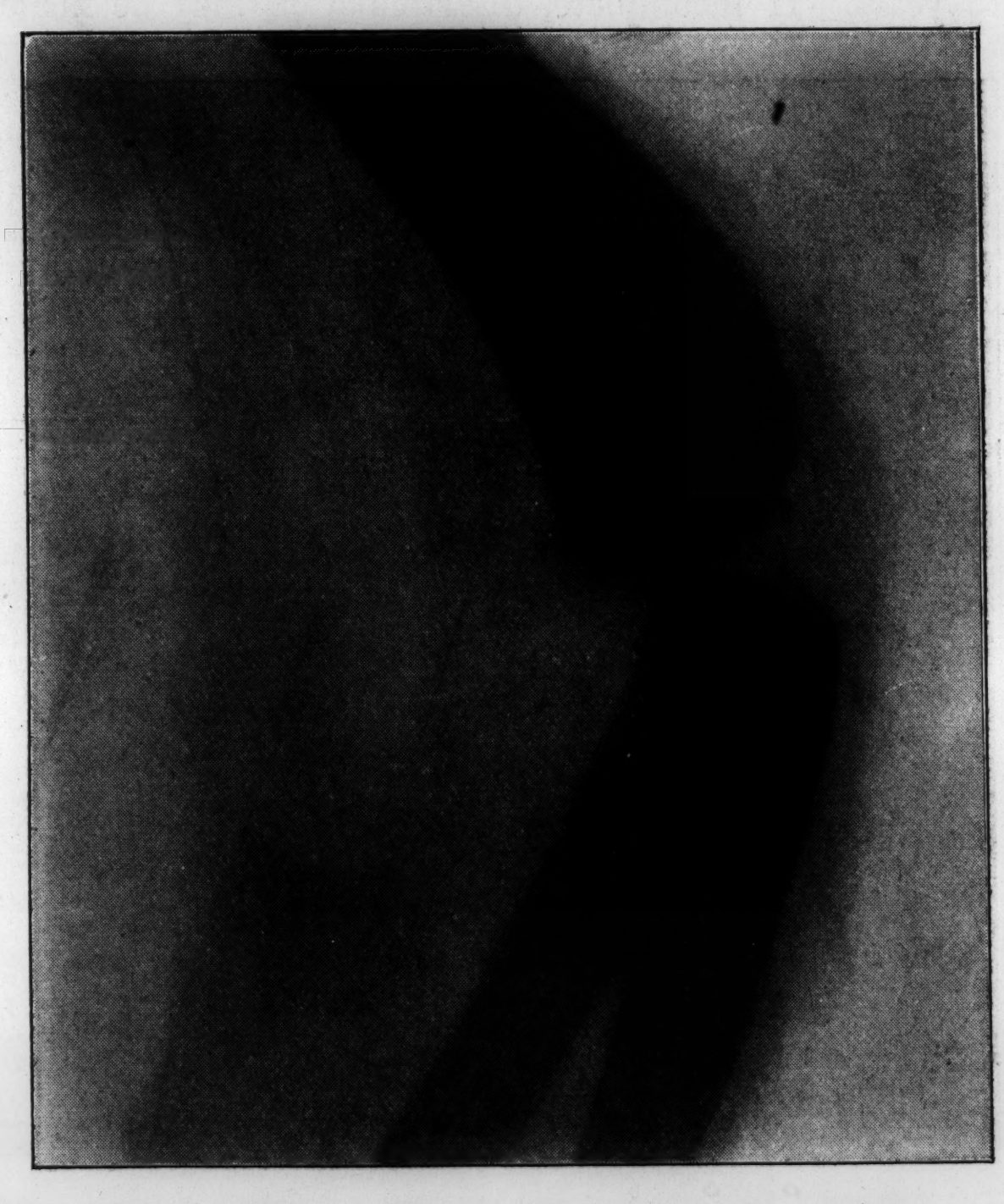


Fig. 4.—Case 2. Miss H., five months after excision.

the radius through its articulating surface about Dec. 15, 1896. The arm was treated by extension for about thirty days, at the end of which time it could not be flexed.

I was consulted on Feb. 5, 1897, when flexion could not be accomplished. Excision was at this time made through a posterior median incision, removing, first,

the olecranon one-half inch below its articulating surface, together with the head of the radius, at a point corresponding with that dividing the olecranon. The lower end of the humerus was divided three-quarters of an inch above its articulating surface. The arm was placed on a right-angle splint, after suturing the cutaneous structures and providing for drainage.

Recovery was uneventful, with the result shown in Figs. 1 and 2, which were taken seven years after the operation.

There is perfect extension and flexion, with pronation and supination. There is about 25 per cent. loss of strength.



Fig. 5.—Case 2. 1, Olecranon; 2, end of humerus; 3, end of radius.

CASE 2.—Ankylosis due to arthritis.

Miss H., aged 22 years, had rheumatism during Oct. 3, 1903. The right elbow was especially involved. Massage and extension were resorted to at varying intervals, resulting in the joint becoming more firmly fixed after each treatment.

About March 15, 1904, she entered the hospital for excision, but, as she was suffering on that morning with a severe attack of acute appendicitis of twenty-four hours' duration, it was necessary to delay the former and operate for the latter. Recovery from the appendectomy was uneventful.

On the sixteenth day following the appendectomy the excision of the joint was made through a posterior

median incision, the cutaneous structures were closed, drainage provided for, and the arm placed on a right-angle splint.

Result.—The limits of motion are from 45° flexion to 180° extension, as against 30° flexion to 180° extension.

With the rapid improvement, there is but little doubt



Fig. 6.—Case 3. Miss P. W., age 27 years. Completely ankylosed elbow joint, two years' duration, resulting from rheumatic arthritis.

that complete flexion and extension will be accomplished. Pronation and supination are almost complete.

CASE 3.—Ankylosis due to arthritis.

Miss P. W., aged 27 years, suffered from an attack of

rheumatism, the right elbow joint becoming partially fixed.

An osteopath "moved" the joint about 208 times during the succeeding twenty-two months. At the end of this time he stated that he would "break" the arm if he was sure as to just where it would break.

July 1, 1904, under chloroform anesthesia, a posterior median incision was made, and the entire joint

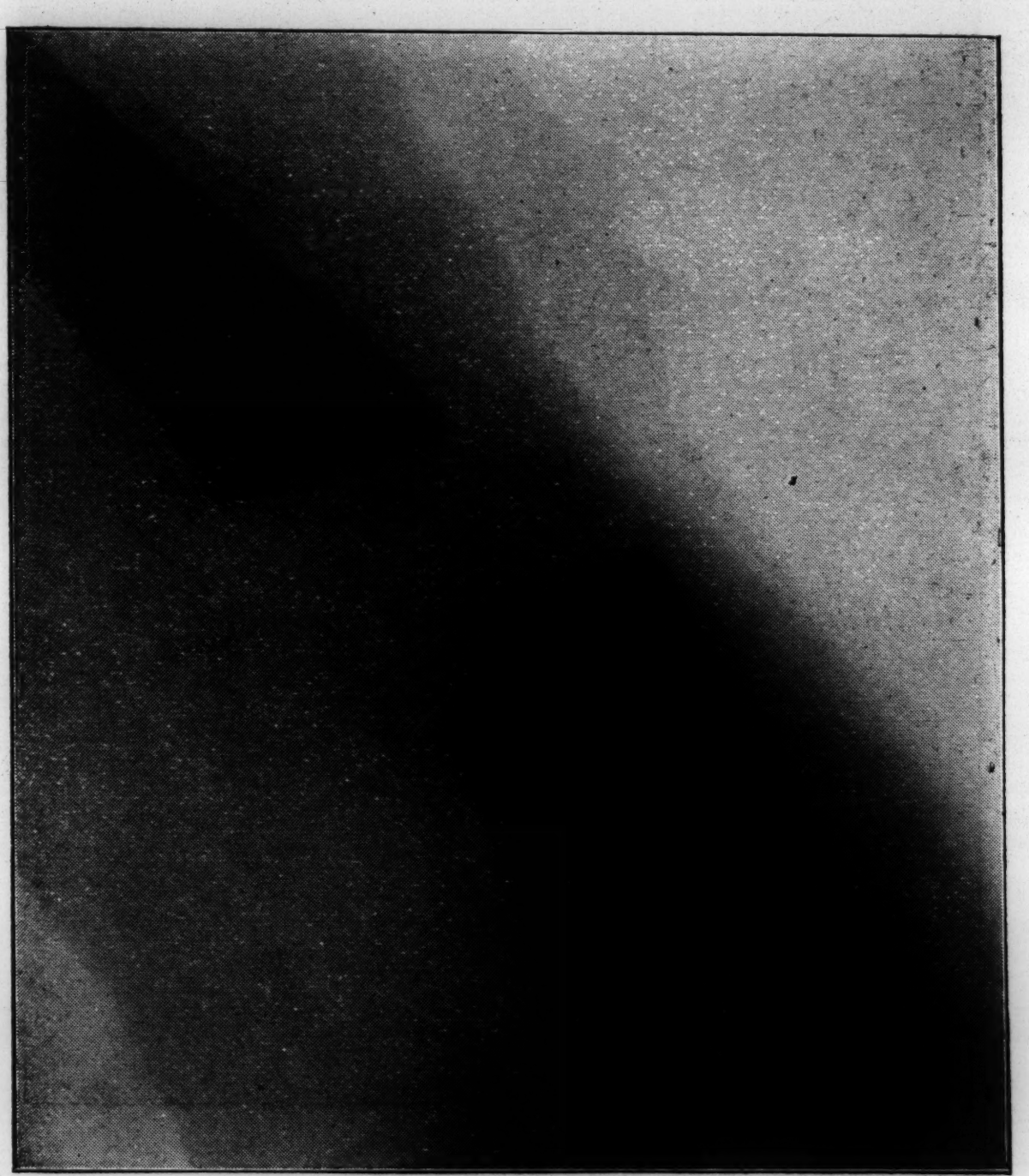


Fig. 7.—Case 3. Miss P. W., age 27 years. Two weeks after excision of elbow joint (extended).

was removed with chain saw. Right-angle splint applied and gauze drainage introduced.

Recovery uneventful, with the result indicated in the skiagraphs taken at varying intervals since operation.

Result.—Flexion and extension perfect, with a loss

at present of 50 per cent. in strength. This is improving rapidly, so that much strength will be gained in the course of time.

CONCLUSIONS.

1. Excision of elbow joint for ankylosis, due to any cause, at any age, is a most rational procedure.

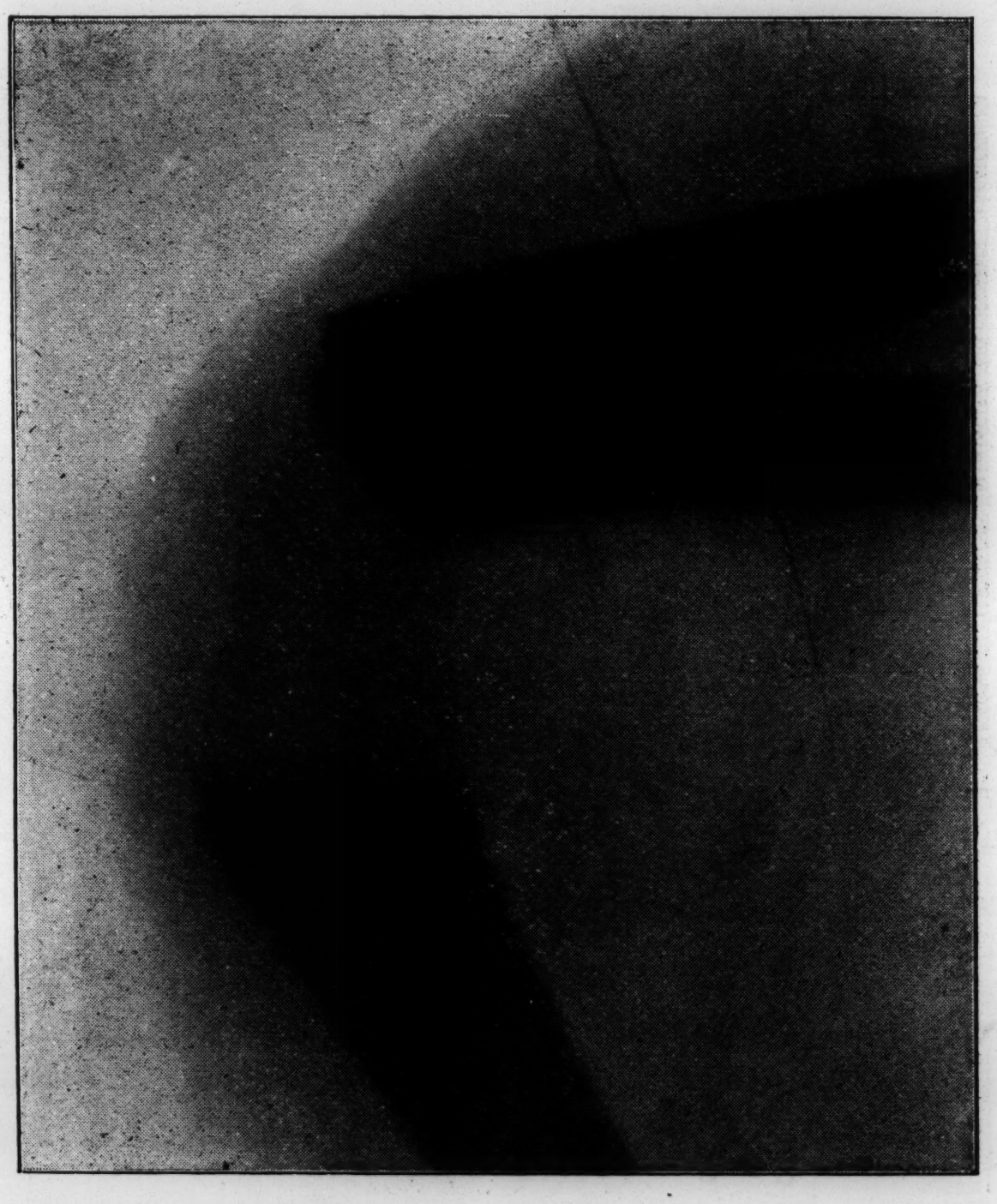


Fig. 8.—Case 3. Miss P. W., age 27 years. Two weeks after excision of elbow joint (flexed).

2. If possible, it should be done before or at the time ankylosis is complete.

3. A posterior median incision is the most practical.

4. With care, the operation can be done without injury to blood vessels or nerves.

5. Drainage should always be provided for.

6. The arm should be placed on a right-angle splint.

7. Results are better when only the articulating surfaces are removed.

8. If there is complete bony union of the articulating surfaces, much more bony tissue must be sacrificed, because disarticulation can not be accomplished.

9. All soft structures cut transversely will unite, but



Fig. 9.—Case 3.—Miss P. W., age 27 years. Five and one-half months after excision.

new insertions are formed which destroy their function.

10. All attachments of tendons and muscles should be preserved.

11. All periosteum should be preserved.

12. If excision of the joint is complete, leaving only the ends of the shafts; flail joint can be prevented by

approximating their ends with kangaroo tendon at time of primary operation.

13. Wire or nail may be used, but their removal sooner or later will be imperative.

14. Flail joint rarely results from any form of excision, but is more likely to be found following excision of the entire joint.

15. If flail joint results, a mechanical device may be employed.

16. Injections of alcohol or one or more of the various

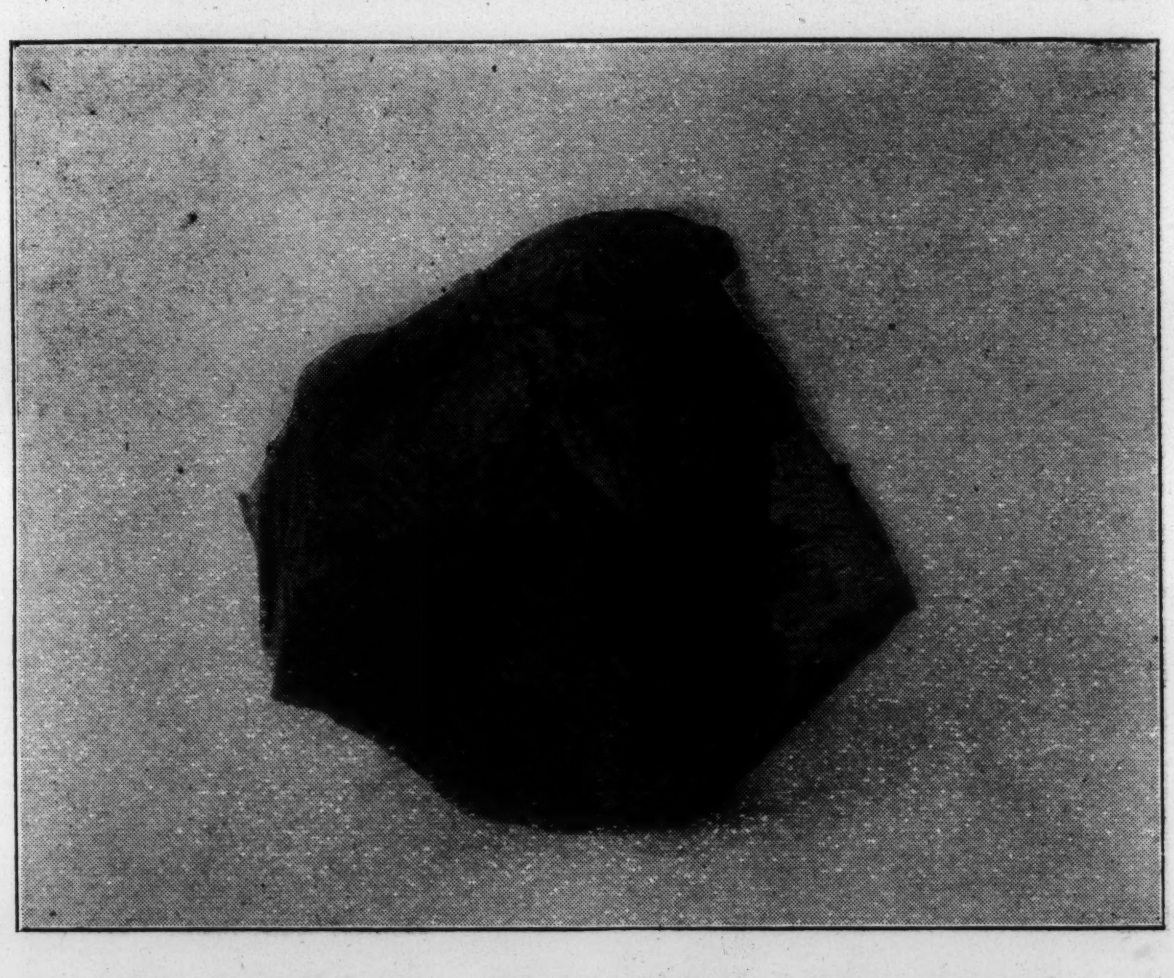


Fig. 10.—Case 3. Ankylosed elbow, joint removed.

astringents will increase fibrous tissue, both in quantity and density.

DISCUSSION.

Dr. Alexander Hugh Ferguson, Chicago—I was very much interested in this paper, as well as in the skiagrams the author has exhibited, showing the results in excision of the elbow joint. With the old method of operating through a posterior incision, we had to remove a large amount of bone in order to get complete flexion or proper extension. We reckoned we had to remove from an inch and a quarter to an inch and a

half of bone, and anything short of an inch and a quarter would get more or less stiffness. With the removal of anything more than two and a half inches, and sometimes that amount, the patient was liable to have a flail joint. Flail joint occurs in one case in five. I think the old incisions should be completely discarded, and I regard the removal of so much bone unnecessary. And, then, what have we to do? Make a long external incision, taking as our guide the thick part of the supinator longus muscle, cleaving between the structures, and cutting no muscles, nerves or vessels of any importance, and get to the bone. We will say, for instance, that we have a dislocation of both bones backward, and

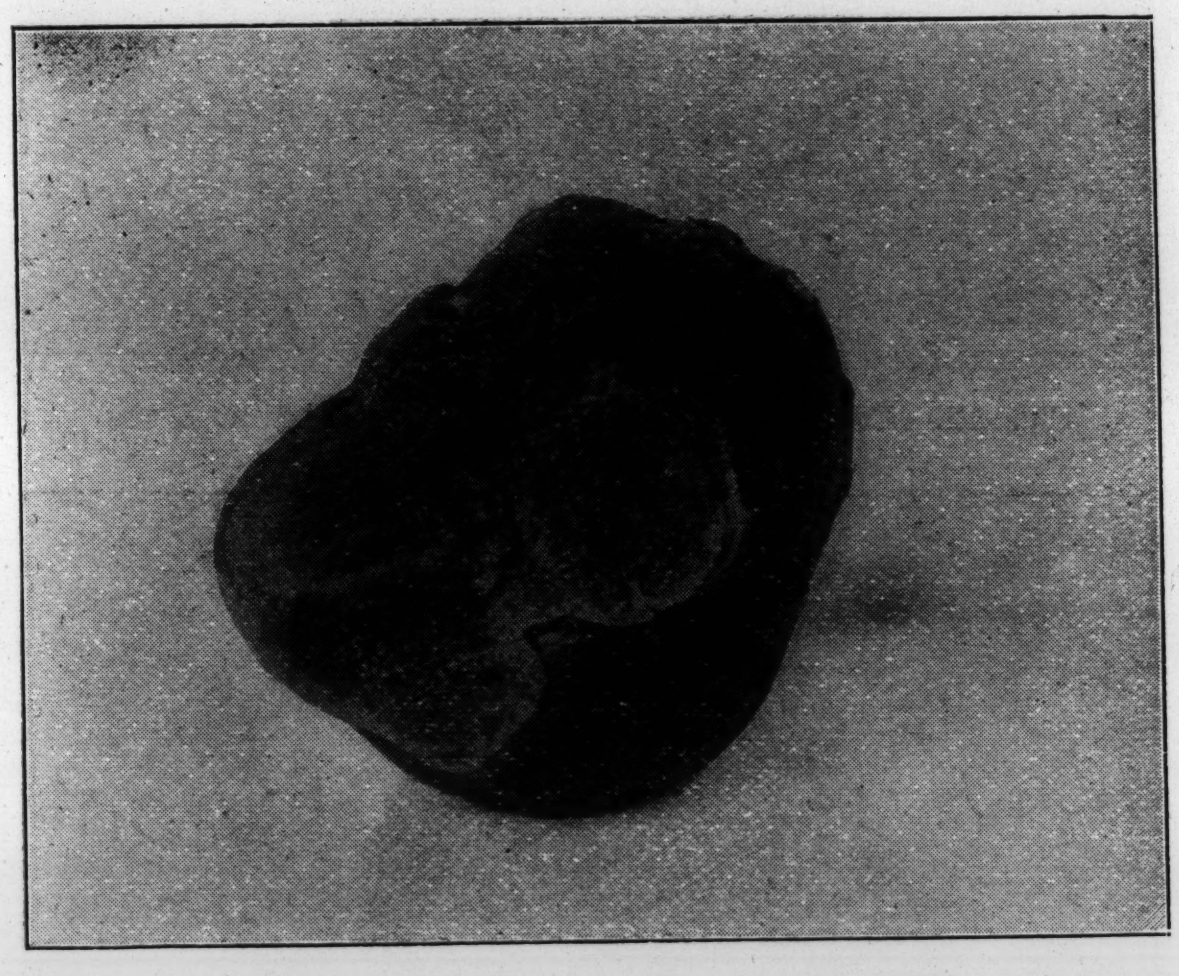


Fig. 11.--Case 3. Showing divided ends of radius and ulna.

an excision is indicated. Chisel off, both external and internal, the epicondyles, leave their muscular attachments alone, cover the raw surfaces of bone with fibrous tissue from the inside, then saw off a minimum amount of the humerus, leaving the ulna and radius alone. Take portion of the brachialis anticus muscle and whip it around the end of the bone, which will prevent bony ankylosis. The results are excellent.

Dr. E. Wyllys Andrews, Chicago—Since Dr. Murphy has not risen himself to say a word or two on this subject, I should like to call attention, briefly, to his

work, apparently in the line of Dr. Ferguson's suggestion. I do not recall the precise details as to what joint, but I know in the knee and elbow joints, as well



Fig. 12.— Case 3. Showing divided end of humerus.

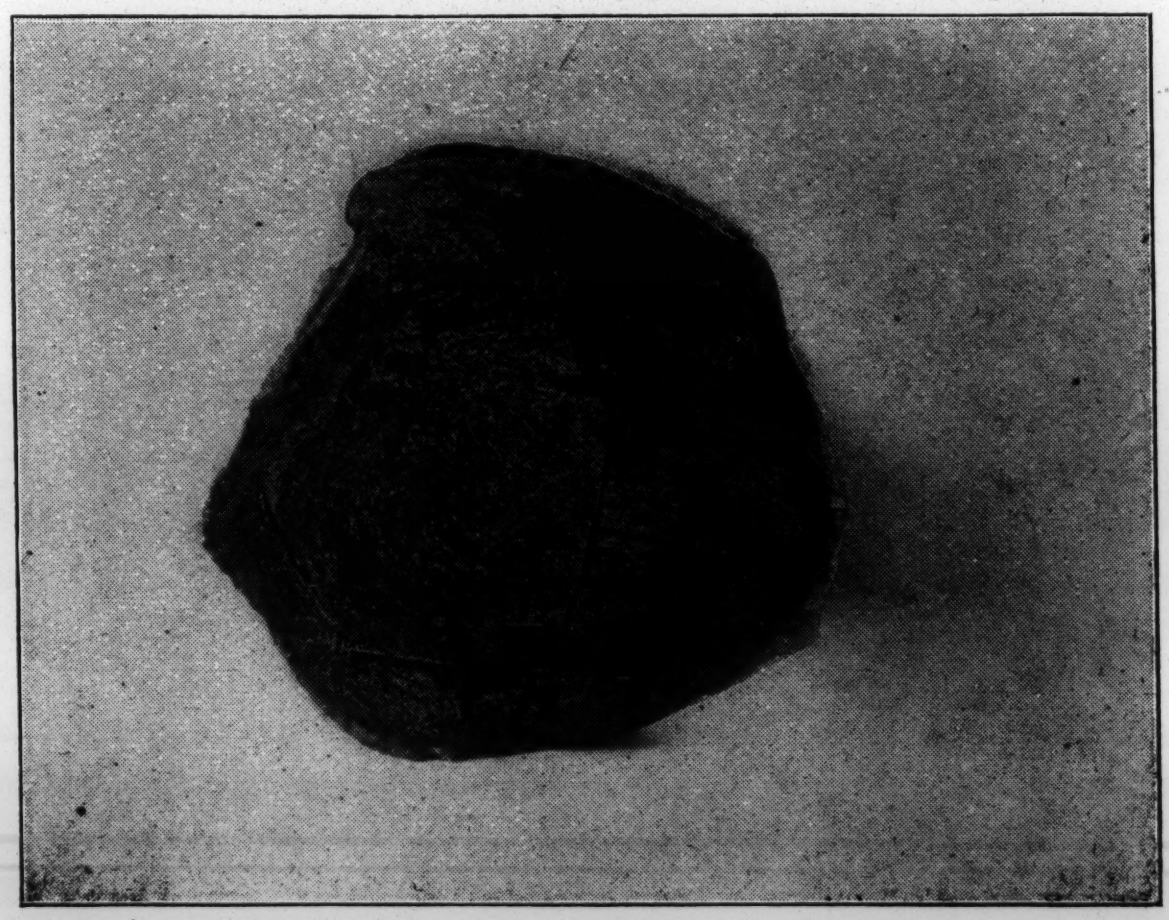


Fig. 13.—Case 3.—Showing olecranon.

as some other joints, he brings in certain of the muscular fascia, transposed from its position between the sawed-off ends to prevent bony ankylosis. The use of

the principle of muscular implantation is somewhat similar.

Dr. James E. Moore, Minneapolis, Minn.—I can scarcely agree with the author of the paper that complete excision of the elbow joint is a panacea for all stiff elbows. There are two important factors to be taken into consideration. The first is the vocation of the patient, and the next is his age. I remember very well that the late Professor Sayre told us, in treating fractures or injuries of the elbow joint, there was one prime requisite, and that was to put the elbow in a flexed position. That is a good rule. If you have a workingman, he will have a more useful arm that is ankylosed

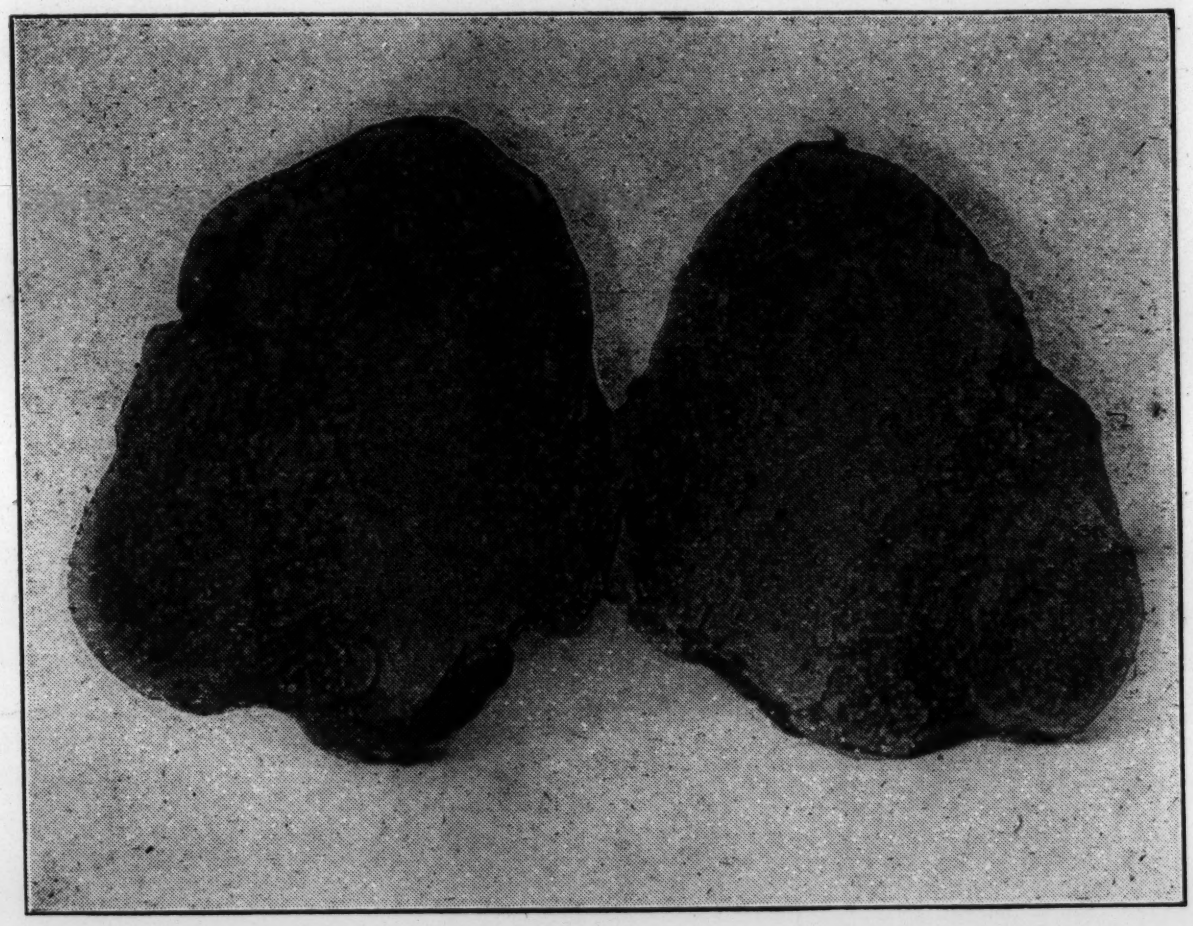


Fig. 14.—Case 3. Showing divided bony joint mass.

at about a right angle than if you give him the best excision of the elbow possible. If the patient is a man whose employment is light, or a lady, I can imagine that many times excision would be more satisfactory, because more small things can be done with it. On the other hand, if the patient is a child, complete excision of the elbow is a bad operation unless it is for tuberculosis or a disease which must be removed, because complete excision means interference with the centers of growth during the following years. While we may get a good immediate result for one or more

years, when that child is grown up, there will be a short, shriveled and comparatively useless arm. I think an excision in such a case would be bad practice.

I mentioned to-day, in a discussion, one case of excision of the elbow in which I used this bone plug, suggested, first, by von Mosetig, and it is the best result I have ever obtained in an adult. The bones were removed, exposed fully two inches and a half of separation, and the cavity was filled with this paste, and it gradually absorbed, so that after two months there was good motion, and now there is most excellent motion, by allowing the bones to come slowly together and nature doing the rest. I think it is going to be of great help in those cases.

DR. RICKETTS (closing the discussion)—I have but a few remarks to make. All realize the wisdom in Dr. Moore's remarks, but there are circumstances under which it would be best to make excision in childhood. Ankylosis of childhood extending into adult life will prevent muscle development, so that an arm of this character is more useless after excision than without it. It is better to leave the divided ends of the bone broad, and, for that reason, complete excision should seldom be practiced. I am not altogether satisfied with the result in the case of complete excision. I would not do it again. I would only remove a wedge-shaped piece.

THE OPERATIVE TREATMENT OF FRACTURES AND SPRAINS.

A. E. BENJAMIN, M.D.
MINNEAPOLIS, MINN.

Many fractures are incorrectly diagnosed and improperly treated. Some are associated with joint dislocation, or an injury known as a sprain. The results obtained in many cases are unsatisfactory to the patient and very annoying to the surgeon when treated in the ordinary way. The *x*-ray has revealed the mistakes of many a past surgeon and is the searchlight of to-day.

We know it is now possible to open up any region, cavity or area of the human body with comparatively no ill effects from the operation *per se*. We are not hindered now by that "bugbear," "stiff joint," nor deterred from uniting fractured bones by sutures for fear of infection.

Intelligent patients are no longer satisfied with a fairly good result, but demand a perfect and permanently satisfactory limb after bone and joint injuries. A bad result is seldom excusable, as we are now able to change our diagnosis from a probably correct one to a positive and accurate one. The Roentgen ray has dispelled the cloud that once hung over this part of emergency surgery. The surgeon who neglects to employ this guiding ray, in certain cases, is doing an injustice to his patient and building his hopes of repair on incomplete knowledge. When it can not be employed, the patient

should understand that the diagnosis and treatment will not always be so exact and certain.

The long bones, when fractured, are frequently much out of line, because of the muscular action. The degree of deformity is determined by the relative location of the injury and muscle connection. The deformity is often so noticeable when the injury is of these long bones that we should be absolutely correct in our diagnosis and sure of direct apposition of the fragments.

Skull fractures are now quite well understood and good results are obtained by operation. The treatment of vertebral fractures is not yet settled, but the tendency is toward operative treatment. Joint fractures have often been neglected and, if we are to progress, must, of necessity, be considered, in most cases, as operative cases in the future.

ADVANTAGES OF OPERATIVE METHOD.

We are certain when an operation is performed that we will discover all the trouble and that nothing will be left undone to assist nature in the repair. One of the most important reasons for operating is to allow the blood and serum to escape from the vicinity of the fracture. We can make a perfect approximation of the osseous tissue. Splinters of bone may be replaced, or when they would act only as foreign bodies can be removed and the fractured ends sutured if necessary. Interposed structures can be extricated. The periosteum can be stitched over some of these exposed surfaces of bone, the fascia and muscle tissue united at the proper plane. Bleeding or oozing vessels can be securely ligated, nerve trunks or nerve filaments can be approximated if severed, or arranged so that they are not pressed on by the bone or callus. Drainage will prevent the unnecessary accumulation of blood and serum, and thereby the fever and pain which results after many of these injuries, on account of its retention, will often be avoided. Induration from the organization of this

fluid is prevented by drainage. In this way we avoid the additional interference with the function of the nerve and muscular tissue, and the convalescence period is less prolonged.

THE INCONSISTENCY OF THE ORDINARY TREATMENT IN CERTAIN FRACTURES.

The more frequently we operate on fractures the greater evidence and more arguments we find for continuing this mode of treatment. This is especially true when a fracture into a joint occurs.

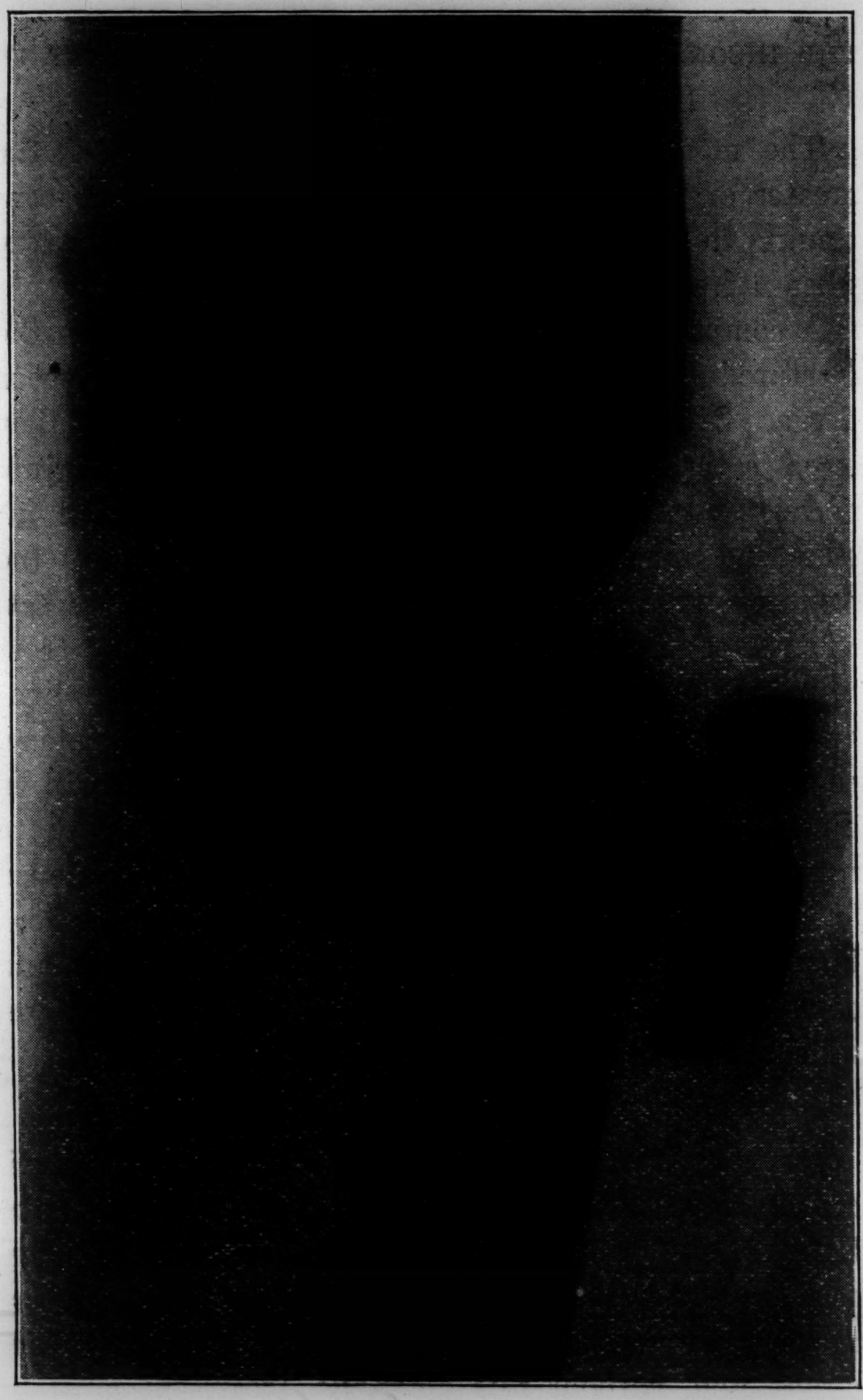
A compound fracture is designated as such when the fractured ends interrupt the continuity of the cutaneous tissue. Often fractures are of such an extent that they lacerate the soft structures, sever blood vessels, injure muscles, rupture ligaments and fascia, and, to all intents and purposes, are compound fractures, except the skin covering remains intact. Many surgeons are satisfied to treat such injuries by immobilization and trust to nature for the rest. They hope that the torn ligaments and muscle tissue will unite in the proper plane, and believe that the exudate of blood and serum will be limited and soon be absorbed. They trust that the nerve trunks in the immediate vicinity will not be enveloped in the callus, or organized mass about the point of injury. In other words, the treatment is inexact and necessarily foreshadows imperfect and uncertain results.

OPINIONS OF SOME SURGEONS.

Dr. M. I. Wilbert, in an article published in *American Medicine,* Jan. 23, 1904, entitled "Fractures of the Extremities," says: "Precision and exactness of diagnosis, without the risk of injuring the surrounding tissue, are practically impossible without the use of the *x*-rays, and, without this diagnosis, treatment must be uncertain."

Dr. Leonard Freeman, of Denver, Colo., read before the Chicago Society, May, 1904, a paper entitled "The

Union of Ununited Fractures of the Neck of the Femur by Open Operation." He advocated the operative method of treatment of many of these fractures.



Photograph N. 18.—Tilting of lower fragment.

Dr. J. Alexander Hutchinson, of Montreal, read, at a stated meeting of the Montreal Medico-Chirurgical

Society, April 1, 1904, a paper entitled "The Treatment of Fractures of the Patella," in which he states: "In several of my cases the large amount of blood clots seemed a sufficient explanation in itself for the tilting forward of the lower fragment. This condition is illustrated in *x*-ray photograph No. 18.

In all cases there is more or less acute synovitis, accompanied by effusion.

"The treatment is divided into non-operative and operative, and this latter further divided into early and late cases. If a non-operative treatment is followed, we must expect that a complete return of function can not be obtained. On the other hand, if operative interference is permitted, it can only be carried out in chosen cases, especially those cases where there is a transverse fracture, with wide laceration of the aponeurosis."

I would not subscribe to this statement entirely, because of my own experience. Case No. 3.

Powers contributes an exhaustive article, in which he records the opinions of seventy-one surgeons, a summary of which shows that four would use Malgaigne's method, seventeen are opposed to operation, nine would operate unless there were distinct contrary complications, forty-one would operate in selected cases, such as with separation and comminution. He also states that recent literature shows a tendency to operate oftener.

Mikulicz secures the patella fragments with wire, stitches the ligaments and closes the wound and dresses it the same as if no operation had been performed.

Dr. Joseph A. Blake, of New York, in an article entitled "Treatment of Fractures of the Patella by Lateral Sutures," states that a suture of strong chromicized catgut, No. 4, preferably, or kangaroo tendon, placed in the lateral patella ligament on each side of the patella, results in good repair.

He also states: "In regard to the time for operation, I consider it is well to operate as soon as is convenient after the injury. I do not wait for the effusion to sub-

side. In fact, I think it is a distinct disadvantage to delay operation over four or five days, since after that time the tissues begin to heal in abnormal relationship, and the difficulty in properly coapting them is thereby increased. Also, by then, the fibrous fringes become attached to the surfaces of the fracture and fresh hemorrhage is provoked in separating them."

I am of the opinion that surgeons will, as a rule, adopt the absorbable sutures for approximation of all tissues, as we are now able to obtain satisfactory catgut sutures, which will last a sufficient time and do not break, as wire sutures will. I have been using such material of late with perfectly satisfactory results.

Parkhill approximates bone fractures by means of pegs extending out through the wound and with clamps, fastening them so they are firm and rigid. He stretches the soft structures around these pegs. The same treatment is adopted for fracture of the head of the femur.

DeForest Willard makes a statement in his article on "Old Unreduced Dislocations," read at the meeting of the American Medical Association, Atlantic City, N. J., which applies to fractures as well, viz., early immediate diagnosis is most important in preventing the existence of old, unreduced dislocations. With the *x*-ray and anatomic and surgical knowledge, a recent displacement ought always to be discovered by the surgeon. Immediate reduction by manipulation, or open operation, should follow.

Dr. Stuart McGuire, of Richmond, Virginia, in an article entitled "Ununited Fractures," makes a number of important statements. I have taken the liberty to quote quite extensively from this article. He says: "A man who dies after an operation is buried and soon forgotten; but the man who has a deformed arm or shortened leg, from a badly treated fracture, lives for a generation, a walking or limping advertisement to his community of surgical limitation or incapacity.

"Usually the surgeon, when called to treat a case of

ununited fracture, deals with it at first by non-operative measures, with the hope that union may simply be delayed, and should his efforts prove unsuccessful he operates on it later under the conviction that it is a case of non-union, not amenable to less heroic measures.

"As constitutional causes of non-union, authorities give a long list of conditions or diseases, such as age, pregnancy, lactation, acute infectious diseases, starvation, loss of blood, rickets, marasmus and syphilis. All except the last are of doubtful influence.

"Under the local causes of delayed union or non-union may be mentioned, first, marked displacement or wide separation of the fragments; second, interposition of muscle, fascia or foreign bodies between the fragments; third, defective nutrition through faulty innervation or deficient blood supply; fourth, infection and suppuration, destroying or preventing the formation of callus; fifth, defective immobilization or premature passive motion."

Thus will be seen that nearly all local causes can frequently be removed by an early operation.

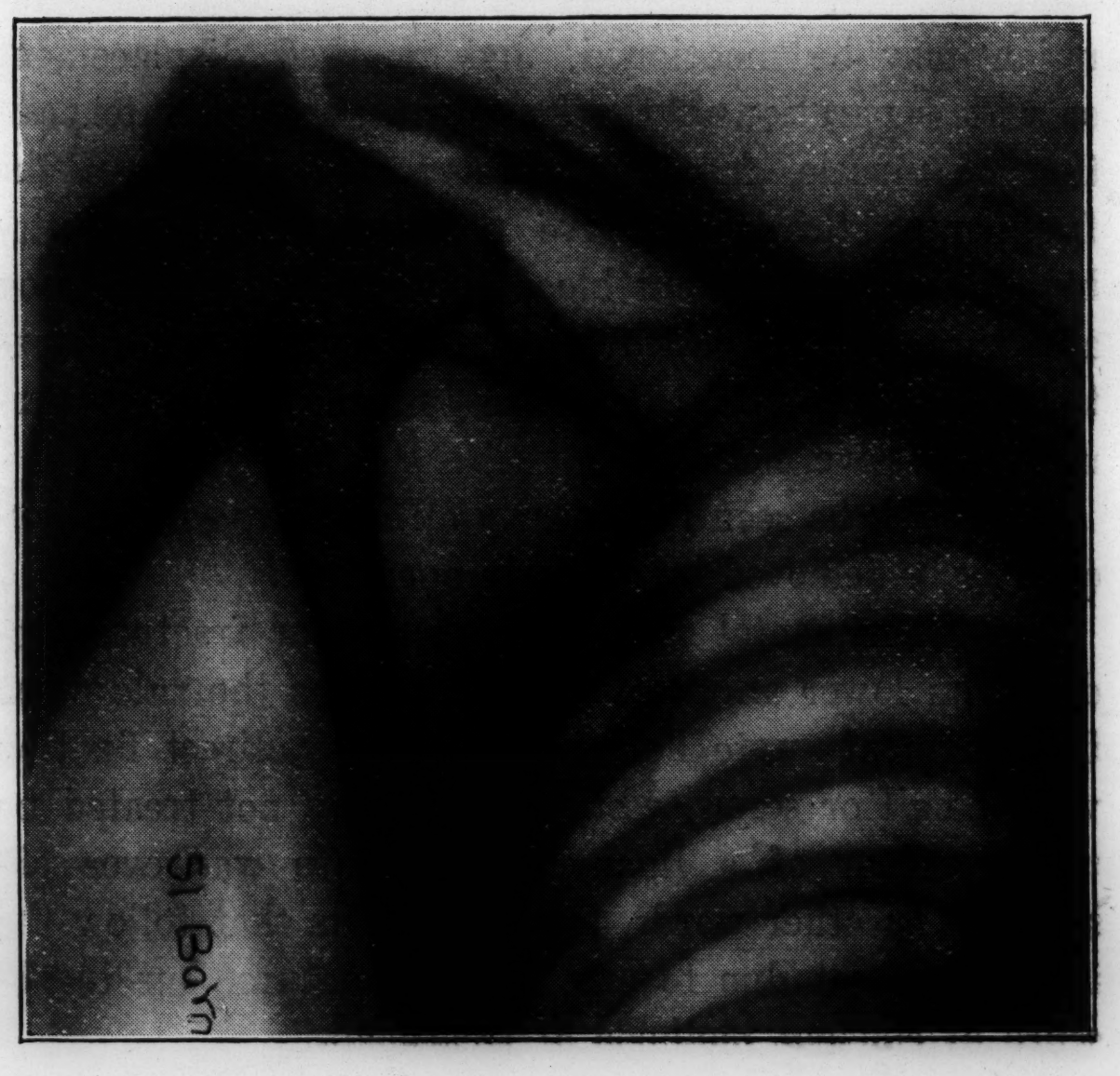
"In experimental cases of intracapsular fracture produced on lower animals, bony union was the rule when the fragments were held in position by direct fixation with a nail or screw, while in the cases not treated no union except of a ligamentous nature was ever observed. In other words, the bad results that follow the injury are not due to any fault of nature, but to absence of efficient methods of treatment."

Stimson, in his latest edition of "Fractures and Dislocations," in a few words, sums up the whole question of etiology of ununited fracture as follows: "It is beyond question that the causes are usually local, and that the most common one is a faulty relation of the fragments to each other, including therein the interposition between them of muscular tissue."

Dr. Robert Carothers, of Cincinnati, in an article entitled "Ununited Fractures," published in the *Cincin-*

nati Lancet-Clinic, says "Defective treatment is at fault in many cases; failures to make a complete and thorough reduction of fragments. It is not possible nor probable, since the *x*-ray can be used as a valuable adjunct in the apposition of fragments."

He further states the following facts: "The sutures for uniting bone fragments can be catgut, kangaroo tendon, silk, iron or silver wire. A forty-day chromicized catgut will be given the preference, and that or



Photograph No. 20.—Fracture left clavicle in two places, sutured with catgut.

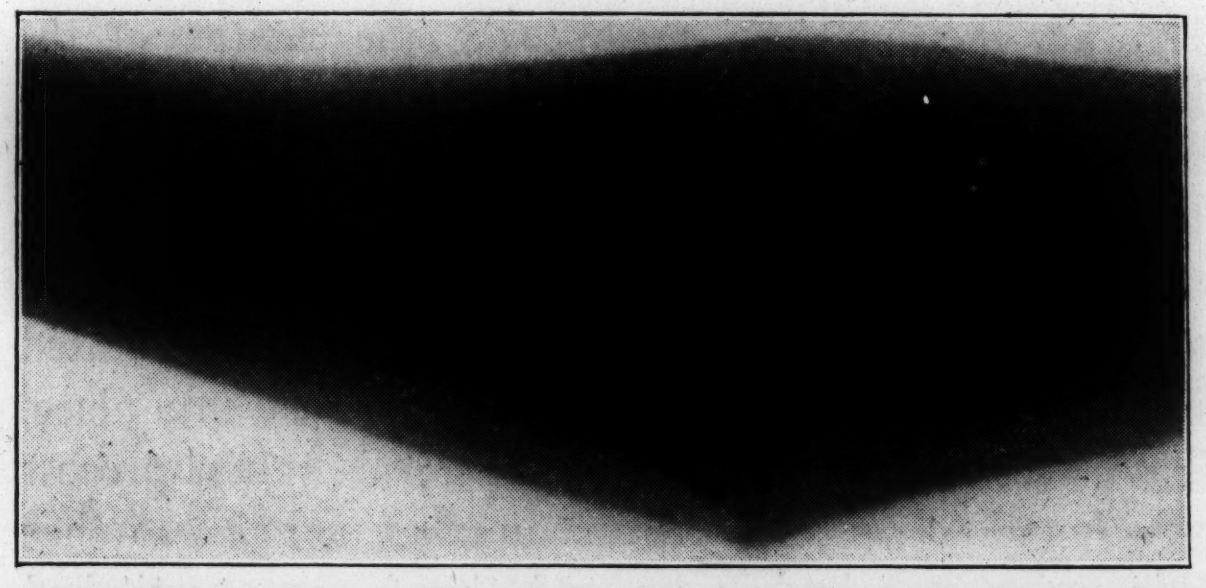
any suture not drawn too tight for fear of breaking while applying the plaster dressing, or strangulating the bone, causing necrosis. Catgut is not so liable to break as is the silver or iron wire and will, when well prepared, properly hold as long as is to be desired. It is then carried away by absorption. Of the metallic su-

tures, there is a difference of opinion, with equal arguments in favor of each."

N. A. Lane (*Practitioner,* March, 1903) is of the opinion, when there is a fracture of tibia or fibula by abduction of leg, a spinal fracture is produced, which demands operative measures, and demonstrates how futile is an attempt at reduction of the fracture by manipulation alone. He also doubts the truth of the statements frequently made as to results obtained by treatment of these conditions by means other than operation.

A FEW CASES.

CASE 1.—Mr. A., age 33, while getting off a street car, fell and sustained a fracture of the left clavicle, as



Photograph No. 23.—Same as No. 22. Anterior posterior view.

shown in photograph No. 20. *X*-rayed and operated two days later by passing catgut ligature around the oblique fracture in two places. The other fracture remained in apposition. A good result was obtained.

CASE 2.—Mrs. J., age 40, sustained a fracture of neck of humerus and subclavicular dislocation of the head. Operated two months later. An incision over the anterior portion of deltoid was made. The head was reduced. The fracture was then wired in place. A good result was finally secured.

CASE 3.—Mr. S., age 35, sustained a fracture of patella by falling on the ice. There was a great deal of

swelling and pain. A longitudinal incision over the center of patella revealed a fracture in three directions. The synovial sac was filled with blood. It was thoroughly cleaned out and the bone fragments united with catgut and one silver wire. A little drainage was used. A good result was obtained.

Case 4.—F. G., boy, age 9 (patient of Dr. Kelley), received an injury to the elbow joint and had been treated by splints and cast for two months by other physicians. The arm could not be flexed, the joint was painful and the head of radius remained dislocated. An *x*-ray picture was taken by Dr. Spring three months after injury, which shows a dislocation of the head of the radius and a fracture of the olecranon and coronoid processes. It was operated on. Assisting Dr. Kelley, an incision was made over the center of the back portion of the elbow in a longitudinal direction. The head of the radius was found to have ruptured the capsular ligament, so that the ligament remained between the head of the bone and the articular surface. This ligament had to be opened and separated in order for the head of the bone to be pushed into place. This was done with difficulty. The olecranon process was found to be united in an angular manner, so that this union was broken up and the fragment stitched more in place. A fairly good result is following the operation.

Case 5.—Mr. P., patient lately of Dr. Spring, injured six months before an *x*-ray photograph was taken. This injury was a fracture between the middle and the lower third of tibia and fibula. No extension had been employed. Splints had been used. Shortening of two inches resulted.

Case 6.—Mr. R., patient lately of Dr. Spring, received a fracture of the left femur, three inches above the knee joint. This injury occurred three weeks previous to the time when Dr. Spring made the skiagraph. It had been treated in the ordinary manner by splints

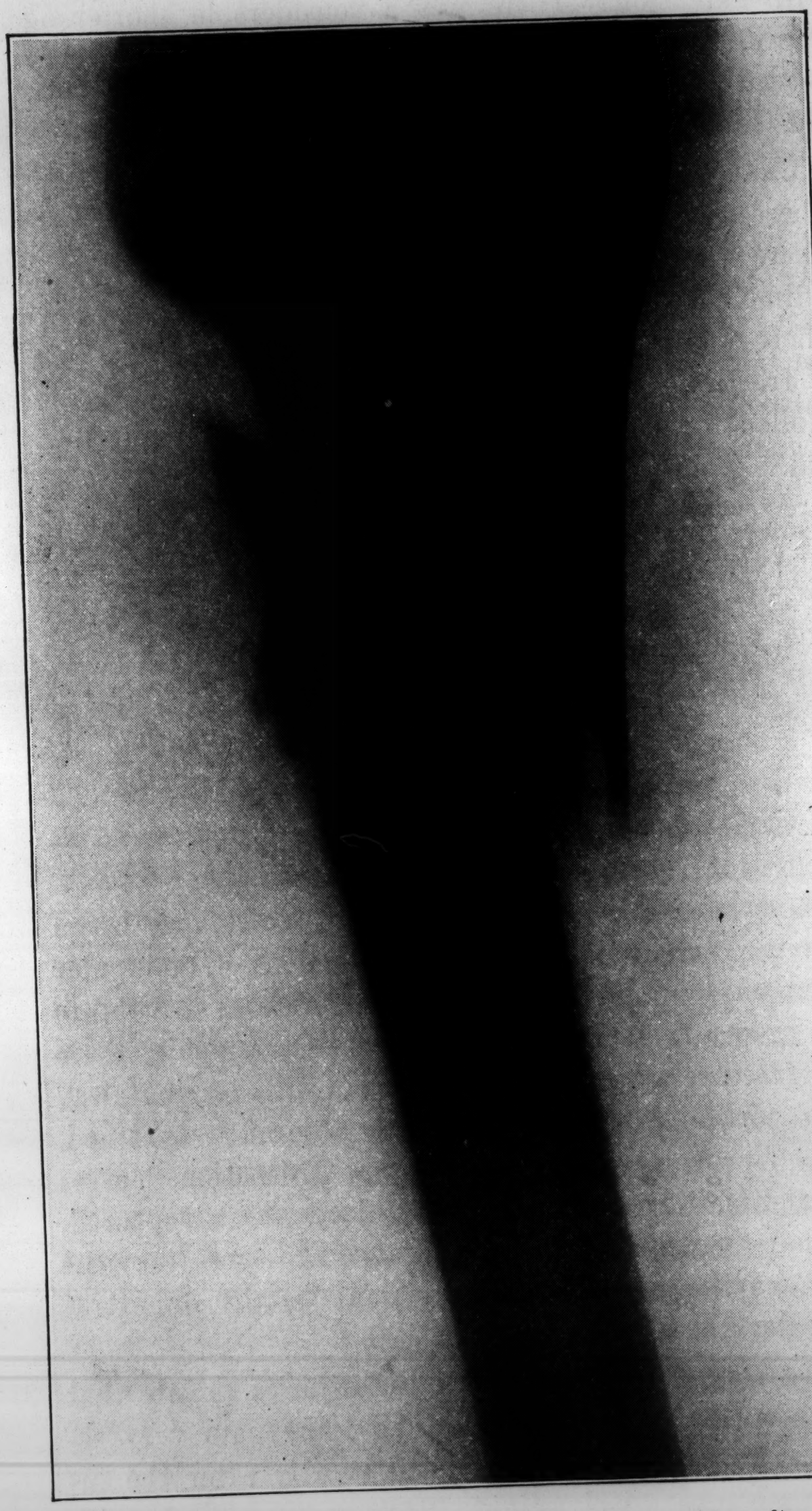
with extension. There was a considerable shortening in this case. The photograph shows what bad surgery is still done in a number of these case. (Photograph No. 15.)

CASE 7.—Mr. T. sustained an injury to left femur. There was a fracture of the lower portion of the shaft. There was a small superficial wound, about the size of a dime, back of thigh, over point where bone was broken. There was a great deal of thickening around the seat of fracture. The whole limb and foot were markedly swollen for some time. Motion at knee joint was limited. There resulted one-half-inch shortening compared with other leg. Sensation was impaired along outer portion of calf of leg. The peroneal group of muscles was paralyzed. An *x*-ray picture taken of this injury three months later shows that there was nearly a transverse fracture of the bone, that the lower fragment is displaced backward and there is overlapping of fragments, also a large formation of callous. (Photograph No. 12.)

SPRAINS.

A sprain is a wrenching of a joint which may be an overstretching of the ligaments, tendons or muscular tissue enveloping it. It may be so severe as to rupture the ligamentous or muscular tissue. Occasionally there is a fracture associated with a sprain or a tearing away of a portion of cartilage. When a joint is sprained, there frequently occurs a temporary dislocation. Nerves are at times severely injured and blood vessels ruptured, so that there is an effusion of blood or serum into the joint cavity, synovial sacs, tendon sheaths or extra-articular tissue.

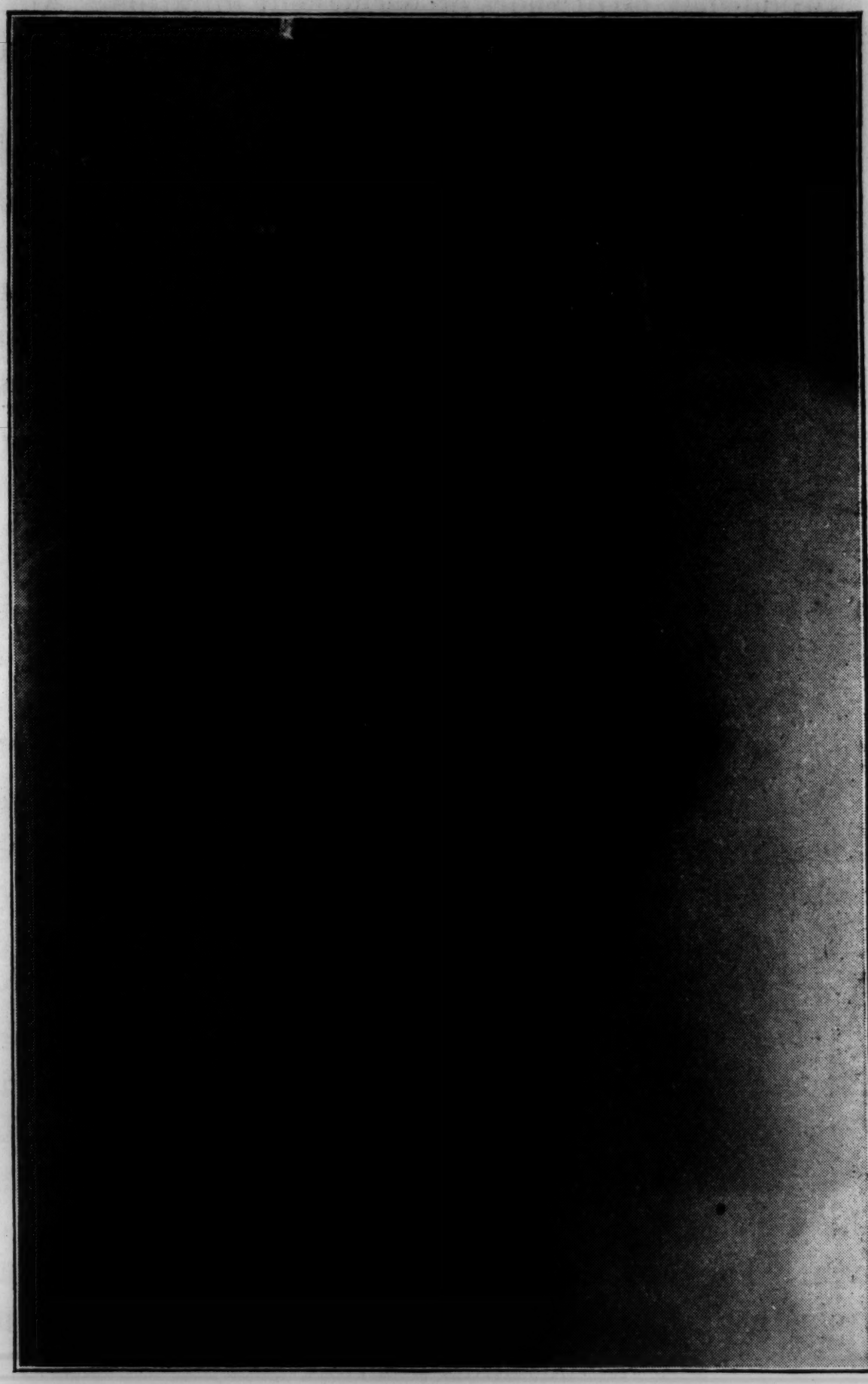
The surgeon so often sees these injuries so late that the swelling becomes enormous and the pain very severe. The pain at the time and shortly after the injury is comparatively slight. It is commensurate with the time elapsed and the amount of exudate that has



Photograph No. 15.—Fracture of femur three weeks after injury.

taken place. The pain continues, even though the limb is immobilized, until the swelling begins to subside.

As a consequence of a sprain, there may be inflamma-



Photograph No. 12.—Fractured femur, side view, two months after injury. Ordinary treatment.

tion and limitation of motion. When the blood finds its way to the surface, ecchymosis is in evidence. These symptoms are temporary, or may persist for quite a

time, according to the severity of the injury and the mode of treatment. Weakness of the joint from the faulty reattachment of the injured tissue and persistent effusion may be of short or permanent duration. Ankylosis, because of tubercular inflammation supervening, is an occasional occurrence.

Fluid, if allowed to remain, which is the case in the ordinary form of treatment, so fills up the areolar tissue and separates the ligaments that they can not unite at the right point, and therefore their union is less firm. Some of the exudate becomes organized and the joint remains weak and enlarged indefinitely. There is then the liability of a recurrence of the sprain.

JOINTS AFFECTED.

Sprains which frequently occur are of the knee, ankle, wrist, shoulder and elbow joints. An associated fracture or dislocation is especially noticed in injuries to the shoulder joint, elbow, wrist, ankle and knee, and quite frequently the hip.

The anatomical construction and mechanism of the knee joint is such that an injury, be it a sprain associated with a fracture of the patella, tibia, or femur, may result in the injury of blood vessels, cartilages or ligamentous tissue. There is occasionally a collection of blood within the joint cavity. Some of the fibrous tissue, when a fracture of this bone occurs, may fill in between the separate pieces. A fracture of one of the condyles of the femur may unite at such an angle that the joint no longer acts with freedom and ease of motion. The ligaments and cartilages may be separated from their attachment, and when they become adherent again are not in the same position because of the distention of the bursal sacs and joint cavity with blood and serum. The knee joint is found to be weak and wabbly in the future because of the laxity of these parts after the absorption of the exudate.

STATISTICS.

Bondesen gives the average period of recovery for knee-joint injuries with effusion if aspirated as 22.4 days; without aspiration, 38 days. Lubbe, in 32 cases aspirated, averaged per cent., 22.5; not aspirated, 34.6.

It is needless to say that cases aspirated would naturally be of severer form. Had they not been aspirated perhaps a much longer average would have been reached than by aspiration.

Bondesen states that recovery was complete in 86 per cent. aspirated, and 63 per cent. not aspirated.

Had these cases been operated upon, no doubt the percentage of good results would have been greater, as ligaments could have been stitched in place and the blood clots thoroughly removed.

THE TREATMENT.

It seems to me the most rational form of treatment in severe sprains is to relieve the pressure and pain, due to exudate, by incision. By an operation upon these injured joints, blood and serum can be evacuated, torn ligaments or injured cartilages may be reanchored to their normal points of habitation, bleeding vessels may be ligated, the tissues thoroughly inspected; in other words, all the organs can be put in their proper relation to one another.

When there is an injury to the bony structure by the pulling away of some of the osseous tissue with the ligament, an exostosis may result and often some nerve in the vicinity is caught in this hardening exudate, which may result in the loss of motion or sensation in the distal extremity. When exact work is done by operative means and a snug dressing applied around the injured joint and the operative field, swelling is less marked, pain is infrequently experienced and the convalescent period is much shorter. The ultimate results are a more perfect joint, a little, if any, weaker than before the injury.

CONCLUSIONS.

From personal experience and a careful study of the subject of fractures and sprains, I wish to offer the following conclusions:

1. Compound and comminuted fractures should invariably be operated upon.

2. Other fractures often lacerate the soft structures in and about the bone, and the injury is as great as in compound fractures, excepting the skin has not been punctured.

3. Such fractures should more frequently be operated upon for the replacement or removal of splinters, drainage, controlling hemorrhage and approximation of ligamentous, muscular and bony tissue.

4. Most fractures should be examined with the *x*-ray when possible.

5. The early use of the *x*-ray shows the location and extent of the bone injury and indicates the mode of treatment, so as to lessen the strain upon the muscles involved.

6. The operative method extricates impinged ligamentous and other structure, repairs injured nerves, lessens swelling, limits the amount of exostosis and organized exudate, and therefore avoids the risk of the callus involving the nerve trunks or interfering with muscle action.

7. We have about concluded that the term "ununited fractures" is a myth and will gradually fade before the increasing knowledge of this condition.

8. Non-union is almost invariably due to the interposition of the soft tissue of imperfect apposition of the fragments.

9. The results obtained by the operative treatment of fractures will do much to relegate Buck's extension, and similar forms of treatment of fractures, to the realms of past unsurgical methods of dealing with this form of emergency surgery.

10. Sprains are often associated with fractures or a dislocation of the bone and cartilage and therefore should also be examined with the *x*-ray.

11. The early operative treatment of bad sprains lessens the accumulation of fluid in or about the joint by establishing drainage.

12. Drainage lessens pain and prevents the organization of the exudate and therefore avoids the interference with muscle and nerve function.

13. The removal of the exudate allows of a greater degree of immobilization by a cast or splint, and makes a normal relationship of joint ligaments more possible.

14. During the operation, ligaments and other torn tissue can be sutured to their normal points of anchorage.

15. Statistics prove that the removal of the exudate from injured joints shortens the convalescent period, produces a firmer joint, and results in a greater proportion of cures.

302 Pillsbury Building.

DISCUSSION.

DR. W. D. HAINES, Cincinnati, Ohio—The position taken by Dr. Benjamin is a very advanced one, and probably will give a severe shock to those who have been in the habit of dealing with these injuries by the old method; but it certainly does appeal to a reasonable mind that he is dealing with them in a rational and intelligent manner. I will speak of one class of injuries, and that is injury to the patella. In dealing with an injury of the patella, I do not always deal with it by the open method; I introduce a buried suture around the fragments, after letting the parts rest for a matter of ten days, with the application of ice to get rid of the effusion and clot, then sharply rubbing the fragments together and throwing a buried suture, either the ordinary 40-day chromicized catgut, or preferably kangaroo tendon, above it. (Dr. Haines illustrated this on the blackboard). When this is done under surgical principles, it will give you a nice result, and put the patient on his feet immediately. You can put on a splint,

immobilize the knee, and put the man on his feet immediately. One feature that commends this procedure to me over the open operation is the length of time the patient is in bed. I have never kept a patient in bed more than ten days where this procedure was carried out. As soon as the acute inflammatory trouble has subsided, I introduce the suture, and put the patient on his feet at once. If he is a clerk he can go on about his business at about the end of a week.

I wish to compliment the doctor on the radical stand he has taken in the treatment of fractures, as the skiagraphs convince us that his method is the better one, but I desire to warn him of the formidable weapon with which he has armed his adversary. For obvious reasons all fractures can not be submitted to *x*-ray for diagnosis and correction; now let us consider a case treated without the use of *x*-ray, in which a bad result is obtained, do you not readily see the frightful consequences which might follow a confession that the *x*-ray was not used?

Dr. Alexander Hugh Ferguson, Chicago—I want to say a word or two about fracture of the patella and subcutaneous suture. Before a subcutaneous suture is put in, one should be sure that there is no fibrous tissue between the two fragments. In order to find that out, it is well to get a history of the accident. If the knee has been bent forcibly at the time of the accident you may be certain that there is fibrous tissue between the two fragments, and in this class of cases the subcutaneous suture is of no use whatever. It is necessary to remove the fibrous tissue and then wire the fragments together.

Another point that must not be forgotten in connection with fracture of the patella is this, that almost invariably there is great injury to the fascia lata on both sides, and that must be repaired.

I wish to compliment Dr. Benjamin on his excellent paper. The more we look at these fractures with the *x*-ray, the more we are inclined to pursue the open treatment.

In connection with the elbow joint, the lateral incision I spoke of a moment or two ago in discussing excision furnishes an excellent route for dealing with fractures at the elbow joint in children and adults.

Dr. A. E. Benjamin (closing the discussion)—I have

nothing more to say except in regard to the suture that is introduced in repair of a fractured patella, without absolute knowledge of the condition of the tissue beneath the skin. There was a time when a hernia or a varicocele was treated in that manner by the use of ligatures without an incision. We have given up that method, because we are not certain of the tissue we include. We have found that we can do better work by absolutely determining the condition present. To sew up a fractured patella involves very little risk comparatively. I think it is not to be compared with the bad results obtained by inexact and uncertain methods. I am glad this was mentioned, because I have said more of these fracures than of any other in my paper, but left it out in reading because of another paper on the program.

In regard to the sutures that are used, I think if we will use chromic catgut sutures, either laterally for the fascia or through the bone we will find them satisfactory and that it is unnecessary to put in a powerful wire. Wire sometimes breaks, and if we use good catgut sutures we can pull them tight and they will not break. We should remove the blood and serum and be sure there is no interposition of soft structures.

THE SURGICAL CONSIDERATIONS OF GASTRIC DILATATION.

A. M. POND, M.D.

WEBSTER CITY, IOWA.

The condition of gastric dilatation is so common and constant a feature of so many diseases of the stomach, that it has really come to form quite a distinct position of its own, and one, it would seem, which demands special analysis and definition.

There is a constant and fixed relation existing in the normal stomach, between the gastric contents, the muscular ability of the stomach wall, and the resistance offered at the pyloric ring, and it is quite obvious that any change in the elemental dynamics of digestion must lead to a consequential disturbance of function, and that disturbance is usually dilatation, unless, perchance, there should exist a compensating hypertrophy in the musculature of the stomach, which, in spite of the resistance offered at the pyloric ring, still maintains the proper relations, and thus the secondary changes do not occur.

The cause of all gastric dilatation should be sought. If the symptom be due to simple atony, or to the atrophic changes in the gastric muscle, the history may extend over a period of years. Quite in contrast to this statement, if the dilatation be due to some of the mechanical obstructions which are secondary to pathologic changes at or near the pylorus the history may not extend over many weeks or months.

The etiology of gastric dilatation in general may be said to arise from two very comprehensive sources. Me-

chanical forces, obstructing the outlet of stomach, and thus increasing the resistance offered at the ring; and debilitating conditions occurring within the stomach wall, permitting an increase in the volume of stomach contents, which is more or less a sequence to the inability to bring the contents to a level which permits duodenal drainage or evacuation.

The mechanical sources may be classed as extrinsic and intrinsic; or, causes arising from without, and causes occurring within the stomach wall itself. The extrinsic causes may be due to tumors, or to pathologic conditions of adjacent tissue or organs. Tumors commonly causing pressure on the duodenum or pylorus sufficient to produce a stenosis or stricture, may be an enlarged gall bladder or a gall bladder filled with calculi, a pancreatic cyst or tumor of the pancreas, omental tumors, growths of the liver, or enlargement of the retroperitoneal glands.

The pathologic changes in the adjacent tissue capable of causing gastric dilatation, may be a perigastritis which has proceeded from a cholecystitis, or empyema of the gall bladder. The local peritonitis thus excited by some inflammatory condition of the gall bladder forms bands of plastic exudate which involve the pyloric end of the stomach in closest proximity and which sometimes completely encircle the small end of the stomach in its contractures. This condition was noted twice in a series of 36 cases. In one case the provoking cause was simple cholecystitis; in the other there were noted changes in the gall bladder, and 34 small gallstones were removed.

Prolapsed right kidney evidently has a very important rôle in gastric dilatation, but whether the dilatation is produced by the displacement of the kidney is at question. Suffice it to say, that the coincidence is far from rare in the observation of many writers.

Bartels was the first to discuss the relation existing

between floating kidney and gastric dilatation, and assigned as a cause, the production of a kink in the pylorus. My colleague, Dr. A. C. Delacroix, in an experience of 50 cases, found prolapsed kidney in 25 per cent. of the cases, and prolapsed left and right kidney in 10 per cent. Litten has found this condition in 55 per cent. of his cases. These observations would lead to a belief that it was more than mere coincidence, and that the descent of the kidney, from any cause whatever, might be associated with gastric dilatation, since it would hardly be probable that the primary dilatation could produce, or be a factor in the production of, malposition of the kidney.

The Intrinsic Causes.—By far the commonest cause of gastric dilatation arising within the wall of the stomach, is a cicatrix of a corrosion or ulcer; in the event of the former, the cicatrix takes the form of hyperplasia or hypertrophy of the pyloric end of the stomach, or the ring, and is not surrounded by the evidence of so extensive inflammation as is found in the cicatrix of an ulcer, where the adhesions may be attached to the liver or parietal peritoneum without, as well as encroaching upon the lumen of the pylorus within. Polypi may arise from the site of hyperplasia caused by erosion, and may be of sufficient size to obstruct the canal.

Spasm of the pylorus may occur for a long time after the healing of a pyloric ulcer, or after an ulcer occurring high in the duodenum, at, or near, the ring. Such spasm is not, as a rule, continuous, but is extremely likely to be excited after a hearty meal, by the irritation of the passage of the gastric contents over the sensitive scar. When it does occur, it is quite sufficient to produce a lessening of the lumen, and a consequential sagging of the stomach wall.

Carcinoma of the pylorus acts in a similar manner as described in the cicatrices of corrosion and ulcer. There is a thickened wall lessening the outlet, and demanding increased force of the musculature of the stomach to

expel the stomach contents through the stenosed pyloric ring. This force is gradually lessened by reason of the lowered nutrition, and soon the stomach sags below a point of duodenal drainage.

There remains but one other condition under the head of causes arising from within, and that is so rare that I mention it merely to complete the classification; viz.: Congenital stenosis. This was first described by Williams in 1841, and since that time but forty cases are recorded.

The debilitating causes must be considered as atonic, or conditions due to the temporary weakness of the gastric muscle, and atrophic, or causes arising from a pathologic atrophy occurring in the muscle wall.

Atonic Causes.—These may be the result of a lowered general vitality, as in convalescence from a long-continued illness, excessive mental strain or worry, which, in turn, produces disturbance of the motor nerve fibers, and the muscle is not sufficiently stimulated by nerve energy to contract enough to empty the contents. The gastric juice has acted upon the meal, and a portion of it—the upper portion—has passed on into the intestines; however, the greater portion is left. The contractures of the stomach become weaker and weaker during digestion, and finally cease; the contents which have been acted upon by the gastric juice, ferment; the fermentation produces gas; the gas dilates the stomach, dragging on the nerve-endings and producing pain. There is mental dullness, and an occasional attack of severe headache as a result of the disturbed metabolism; further than this, the secretion of HCl is always greatly in excess, and is excited by the presence of this fermenting mass in the stomach.

The atrophic changes follow closely on the heels of the condition described above, and may be said to be produced secondary to long-continued atony where the atrophic changes have taken place as a sequence of a lack of proper nutrition; as a result of neurasthenia,

where the motor impulse is impaired, and insufficient use of the muscle produces lowered activity and consequential atrophy; and, lastly, as a result of constant dragging or traction, as in the case of a prolapsed kidney, or a tumor of the lower abdomen, involving the gastro-hepatic omentum, and drawn down by its adhesions.

The methods of diagnosis can be considered under two distinct heads, viz.: Symptoms and physical findings. Perhaps the most valuable symptom is pain. Its character, location, duration and severity teach us much, and I will briefly consider its manifestations, following closely the foregoing classification.

In the gastric dilatation from mechanical extrinsic sources, or from sources arising from without the stomach wall, the pain depends upon the location and character of the obstruction; for instance, if the obstruction be a large gall bladder, or is due to perigastric adhesions, or tumor of the pancreas, the pain would be an acute, tearing pain, following shortly after a meal, and occurring during the contractures of digestion. Again, if the obstruction is a tumor of the omentum, or liver, or is due to enlarged retroperitoneal glands, or prolapsed kidney, the pressure produces an artificial stenosis of the pylorus, and digestion is not completed. In these conditions, the pain is not acute, but is a dull, heavy, dragging pain, which, indeed, it is, as it is the fermentation of the gastric contents, retained by reason of the disturbed dynamics—a stenosed orifice—which produces gas sufficient to dilate the stomach and drag on the peripheral nerve-endings. This pain is usually relieved by taking bland food, or sometimes even a drink of water, and it is in these conditions in conjunction with the same symptoms following the disturbance of gastric tone, that the laity learn to use solutions of sodii bicarb.; the alkali neutralizes the excess of HCl, and gas, in large quantities, is expelled, and the symptom of pain subsides or entirely disappears.

The character of pain conspicuous in the intrinsic causes is more typical. In cicatrices of corrosions and ulcers, the pain is acute, short and very severe. Fenwick states, in his "Résumé of 3677 Cases," (1904) that pain is frequent and severe where the walls of the curvature are the site. Growths of the cardiac end are least painful. Pain is greatest after meals.

In the case of polypi arising near the ring, the pain would be more of the character described under extrinsic causes. In other words, it would produce a dull pain, due to the excessive dilatation of the stomach.

Spasm of the pyloris is an acutely painful seizure, but can readily be recognized by the short duration, great severity, and irregularity. In carcinoma, pain is early and, in most cases, is a continuous symptom, varying in severity according to its proximity to the pylorus. The first pain may be dull and oppressive, but later it becomes more acute, simulating the character of the ulcer pain. Pain in the cases proceeding from debilitated muscle wall is, as a rule, due to the excessive fermentation induced by the inability of the musculature of the stomach to evacuate its contents.

It will be observed, then, that the pain in gastric dilatation is sharply defined under two distinct heads. If it be acute, we think of ulcer, perigastric adhesions, gall-bladder encroachments, cicatrix of either ulcer or corrosion, spasm of the pylorus if irregular, and carcinoma. Such pain is increased, as a rule, by eating or drinking.

If the pain be dull and dragging, and if it be relieved by taking bland food, or by sodii bicarb., we can assume that it is due to obstruction; either from pressure exerted from without, as, for example, tumors, prolapsed kidneys, etc., or it is a consequence of an incompetent muscle wall.

Vomiting is a most significant feature. It accompanies ulcer, stenosis (if severe), spasm, carcinoma, and the more intimately related extrinsic causes, as gall-bladder disease and perigastric adhesions.

In emphatic contrast, it is very rare that vomiting will occur in cases due to the impaired gastric wall. These patients will tell you that they never vomit. In a series of 36 cases, I have failed to get a history of involuntary vomiting in a single case, no matter how much they feel the need of it. They seem to find it impossible to empty the stomach by emesis. Consequently you will find the majority of them using stomach-tubes, having been taught their use by their physician, or they drink large amounts of water, and provoke emesis by tickling the pharynx, or by irritation with the fingers.

The physical findings in gastric dilatation need only to be passed in review, since the ordinary methods of physical examination apply in these cases. Perhaps the commonest physical finding is a splashing on succussion. The symptom is constant, and is exaggerated relatively to the extent of dilatation; one precaution in regard to the reliability of this symptom is its absence after meals, for, as a rule, the relieved stomach rises to nearly its normal position, and the splashing will not be heard.

Quite naturally, the capacity of dilated stomachs is increased in exact ratio to the extent of possible laxity of the stomach wall.

Some men fill the stomach with water or air; then, by means of percussion and observation, map out the contour of the stomach. If the patient is prone and the stomach well filled, the marked protuberance of the surface in the epigastric triangle will be noted, and, if water has been used, careful measurement of the contents siphoned after percussion will give the relative increase in size. Do not fail to examine the patient for prolapsed kidney in the course of the physical examination, and if found, nephropexy should be included in the operative procedures for relief.

The uses of Lockwood light, or gastrodiaphane, was described by Kemp, in April, 1904. His method is founded on a series of experiments, and is as follows: Sodii bicarb., grs. xv-xx, is dissolved in a glass (8 oz.)

of water; the patient is given this solution in order to neutralize the acidity of the gastric contents. This is immediately followed by another glass (8 oz.) of water in which are dissolved grs. xv-xx sodii bicarb. and 1/8 gr. of fluorescin. The patient is then taken into a dark room and a Lockwood light, or gastrodiaphane, is introduced in a manner similar to a common stomach tube; it is, however, much smaller, and can be manipulated without producing very much gagging or attempts at vomiting. The light is very brilliant, and contained, as it is, in a fluorescent medii, the entire stomach can be made out, the lower border located, tumors or hypertrophy of the pyloris identified, and tumors of the liver, the transverse colon, and the omentum covering the area of illumination, can be detected. Kemp has also had excellent results from the use of quinin bi-sulph. grs. x, dissolved in 8 oz. of water, to which is added mv acid phosphoric dilute, and this is followed by another glass of water.

The chemical and microscopic findings in gastric contents examination are too well known to require any further comment from me at this time; suffice it to say, that no stomach examination is complete without gastric contents examination.

After all, the best and most satisfactory means of reaching a positive diagnosis is by exploratory laparotomy. This reveals the conditions as they are, eliminates all guesses, does away with all hypotheses, and leads the surgeon straight to the seat of the trouble, beside sparing the patient weeks, months, possibly years of semi-invalid existence, which he barely tolerates, and during which he is the constant object of the concern, sympathy and solicitation of his friends and family.

Mere exploration will reveal the extrinsic causes of gastric dilatation, and the diagnostic exploration can be converted into curative operation without further inconvenience or delay. The tumors encroaching upon the duodenum or pylorus may be removed, the perigastric

adhesions separated, the cicatrices of corrosions or ulcers palpated, a polypus identified, carcinoma recognized, and surgical procedures undertaken which will most nearly restore the function of the part to normal. Should it be impossible to remove the encroaching tumor, the operation of gastro-enterostomy is clearly indicated, whether by suture, Murphy button, McGraw ligature, anterior or posterior operation. These important details must be decided according to indications and operative selection.

In stricture or stenosis of the pylorus, proceeding from corrosion or hyperplasia, the operation of pyloric dilatation is to be attempted. This can be done sometimes by invagination through the wall of the stomach as practiced by Hahn. Loreta made an operation known as "pylorodiosis," in which he dilated the pyloric ring through an incision on the anterior wall of the stomach. The dilatation was accomplished by stretching with the fingers, and, while apparently a simple procedure, was followed by a mortality rate that would hardly commend it to the conservative surgeon.

Pyloroplasty was originated for the same class of cases. The simple, perpendicular incision, and the longitudinal suture of the same, was modified by Mayo-Robson introducing a bone bobbin into the lumen of the ring.

Unquestionably the operation of choice in this condition is gastroenterostomy, unless sufficient dilatation can be had by invagination. Gastroenterostomy, or Finney's operation of gastroduodenostomy, are equally as well suited in cases of cicatrices of corrosion or ulcer, providing the cicatrix is on the anterior surface of the stomach. Where the cicatrix is found at or near the pylorus, gastroenterostomy is to be preferred. Pylorectomy, or partial gastrectomy, is obviously indicated in carcinoma where the growth occurs at or near the pyloric end.

In meeting the requirements for restoration of im-

paired function due to atony or atrophic changes in the muscularis, the simplest procedure that promises the greatest restoration, and at the same time does not in any way endanger the patient, is, perhaps, gastroplication. The greatest objection to this operation in the past has been the fact that it leaves the mucosa either in rugea or one large fold, which gives opportunity for the retention of fermenting contents of the stomach, thus producing a recurrence of the symptom.

In the last three cases of gastric dilatation due to the impaired stomach wall, the writer has modified the standard operation, which procedure overcomes these objections. Sufficient time, however, has not elapsed to warrant a description of the operation. The last case was operated June 4. In each instance very satisfactory results have followed. The success of the operation, however, is dependent on two very important factors, viz., patency of the pyloric orifice, and the ability of the gastric muscle to regain its normal tone.

In conclusion, permit me to say that gastric dilatation is usually a sequence, rather than a primary cause, of discomfort, and that it owes its presence to some disturbance of the elemental dynamics of digestion. It is, on close analysis, merely one of a symptom complex of the upper abdomen, but a very valuable one, the importance of which must be included in the considerations for operative restoration.

DISCUSSION.

DR. CHARLES W. OVIATT, Oshkosh, Wis.—I have been very much interested in this paper, and, as there are so many conditions giving rise to gastric dilatation or gastroptosis, it is difficult to arrive at the actual cause, and it seems to me we are in danger of rushing in and doing gastroenterostomy too frequently. Until some one can give us a more definite means of making a diagnosis we should be more careful. We know that in ulcer of the stomach and in extreme dilatation, gastroenterostomy gives marked and prompt relief, and, while the mortality is only about 5 per cent., the opera-

tion should not be done without the most careful elimination of every other possible remedy. However, this ground will be covered so fully by Dr. Coffey in his paper to-morrow that I do not feel like discussing the subject further.

Dr. A. W. Abbott, Minneapolis, Minn.—In regard to prolapse of the right kidney, after examining over two thousand women who were subject to abdominal or pelvic disease, more than 75 per cent. were found with kidneys which were movable beyond what we consider normal; that is, about three-quarters of an inch, which corresponds to the respiratory movements of the kidney. Therefore, we may assume that the coincidence of movable kidney and gastric dilatation is not much more strange than the fact that these women have prolapsed kidneys and stomachs.

Among the causes of gastric dilatation may be mentioned one which, perhaps, is rare—an indirect traction on the stomach, for instance, the omentum shortened and attached low in the abdomen, so pulling down the transverse colon and stomach, and indirectly in that way giving rise to dilatation, which will correct itself when the adhesions are relieved.

Dr. D. C. Brockman, Ottumwa, Iowa—If I interpret this paper rightly, the gist of it is this, that it is absolutely impossible in the majority of cases to make an accurate diagnosis from the outside. When we have long-continued digestive trouble; when we have the appearance of chronic gastritis, so-called, which has been treated for eight, ten or twelve years possibly without very much relief, there is only one thing left to do, namely, make the nearest possible diagnosis from the outside we can, and then verify it by an exploratory laparotomy and do what is necessary when we get inside.

Dr. B. B. Davis, Omaha, Neb.—This subject is very interesting, and the point made by Dr. Oviatt in regard to not doing gastroenterostomy in all these cases is a pertinent one, and I have thought of some cases I have had in that connection. Two or three years ago I took the position that in all these cases, where we had a severe dilatation, no matter what the cause, in order to be practically sure of getting results when we operated, we were not to do a gastroenterostomy. I have followed that plan for some time. I have had a number

of cases in which there was a severe prolapse, sometimes accompanied by a very movable prolapse of the right kidney, with the liver being involved in some cases, where, by stitching up to the anterior abdominal wall, by a method which I have used for some time, the lesser omentum to the very highest point in the abdominal wall that one could reach, and putting sutures near the stomach, but not in the stomach, and thus holding it up, in that way drainage was secured, so that in a short time the stomach resumed its normal size and tone. In all these cases, where we can put the stomach in the right position by suturing it, where we can do away with the original cause of the stenosis, that should be done, and then afterward see that the patient is put on a correct diet, with the hope of effecting a cure without doing as radical an operation as gastroenterostomy. The results I have had in those cases have been so good that I feel like treating others by that method.

Dr. Emil Ries, Chicago—I desire to say a few words on this subject. Is it possible to make an absolutely exact diagnosis before making an incision in these cases? I do not think so. Even after an incision has been made, it is not an easy matter sometimes to make an accurate diagnosis. There are cases where the abdomen is opened in which we find a tumor in the stomach, thickening of the stomach, extending over a large area of the stomach, where the symptoms are those of obstruction of the pylorus, gastric dilatation and tumor before the incision is made. If we go in we feel a tumor; we have it under our eyes, yet how can we tell whether it is carcinoma or some other tumor or a benign swelling? Such cases present themselves. What is a callous ulcer? Simply an inflammatory thickening of the stomach walls, which, on inspection and palpation, can not be differentiated readily from carcinoma. How can we differentiate such a tumor from a carcinoma? What means have we? It is usually said that in carcinoma the glands are involved, and all that. The glands may be involved by an inflammatory condition. On the other hand, we may have a tumor which is a distinct carcinoma, but we find no enlarged glands.

In looking over my cases recently for the purpose of publication, I found a number of such instances. There was one woman who had symptoms of gastric dilatation for over two years. A tumor was distinctly palpable;

she was extremely emaciated; she vomited a good deal; she weighed 65 pounds at the time of the operation. After opening the abdomen I felt that the pyloric half of the stomach was thickened, hard, non-adherent, and I said to myself, Is this carcinoma or is it not? In cases of doubt I think it is best to be radical, and so I removed that half of the stomach. The woman made a good recovery. She weighs now 136 pounds. I examined the stomach a short time since and found no evidence of carcinoma in this large tumor mass.

I then operated on a man who weighed 85 pounds. He was very much emaciated; he had enormous dilatation of the stomach, and there was a tumor palpable in the region of the pylorus. After opening the abdomen a tumor could be seen adherent to the liver. The glands were enlarged. I thought it was surely carcinoma. As the tumor was adherent to the liver I determined not to remove it, but performed gastroenterostomy four years ago. The man is still alive and weighs 160 pounds. Still it seemed to be carcinoma from all appearances.

Another case: A man, who weighed 100 pounds at the time of operation, but who had weighed 200 pounds, had an enormous dilatation of the stomach. I operated and found thickening of the pylorus. There were small nodules in the lesser and larger omentum, with enlarged glands. The case was considered to be one of carcinoma; I did gastroenterostomy, closed the abdomen, and the man is alive to-day. The operation was done five years ago. The small nodules I removed were not carcinomatous at all, but proved to be endarteritis nodosa. The rule, therefore, is that, in case of doubt whether a certain tumor is malignant or benign, we must act as if it were malignant.

Dr. Pond (closing the discussion)—About the only thing I have to add to the paper is to correct Dr. Abbott, who misunderstood me in regard to what I said about tumors of the transverse colon.

I wish to thank the members for the kind manner in which they have discussed my paper.

TREATMENT OF ACUTE PERFORATION OF THE UPPER ABDOMINAL VISCERA.

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This paper will be limited to a consideration of perforations of the stomach, duodenum and gall bladder arising from internal causes, and taking place so suddenly that time for the formation of limiting adhesions has not been allowed. A discussion of the causes leading to such perforations will not be attempted. Suffice it to state, in passing, that, for those of the stomach and duodenum, an ulcer may usually be held to account, and for those involving the gall bladder the blame must most frequently be laid at the door of cholelithiasis. The importance of the early recognition of these accidents can not be overestimated. Acute perforation of the viscera of the upper abdomen must be considered as a more serious and more rapidly fatal accident than such perforation occurring in the lower abdomen or pelvis. The reasons for this are obvious. It is a well-known fact that the upper peritoneal area is much more absorbent than the lower. That septic fluids in this region are taken up by the lymphatics with great rapidity, and that the signs of constitutional disturbance ensuing therefrom are extremely rapid in onset and marked in intensity. Also that the fluid contents of the stomach and duodenum, markedly septic, are at the same time quite thin, and their extravasation is apt to be prompt and free. That the contents of a gangrenous, necrotic gall bladder, whose drainage has been long

shut off, are highly infectious is beyond cavil. Finally, these perforations, occurring high in the abdominal cavity, are accompanied by extremely widespread, rapid extravasation of the escaping fluids, because of their tendency to gravitate toward the most dependent portion of the cavity. This results in the rapid soiling of large peritoneal areas from the diaphragm to the bottom of the pelvis, and it is much more swift and certain a process than one which, by way of the absorbents, must work from below upward.

Symptomatology.—In brief, the symptoms of acute perforation of one of these three organs are those of a more or less diffuse and violent peritonitis of the upper abdomen and, in my experience, usually observe the following order in their appearance:

Pain.—Pain is usually immediate and most severe, the patient throwing himself about from side to side and complaining most bitterly of agonizing pain, which is most intense about the region of the umbilicus, and which is so constant and persistent as to allow him no respite. If asked as to the location of the pain, the patient will usually state that it is general, but close questioning may elicit the fact that at first it was most severe above the navel.

Vomiting.—Vomiting has been present in all of the cases observed by the writer, usually appearing shortly after the accident and recurring every two or three hours. In no case has pure blood been vomited, but in all the vomitus has been dark brown and containing much mucus and bile.

Muscular Rigidity.—The appearance of muscular rigidity has been most prompt and constant in every case. The abdominal muscles have been contracted to an extreme degree, presenting a board-like hardness and rendering the contour scaphoid, except in unusually protuberant abdomens. In the six cases observed by me it has been possible to demonstrate that the right rectus was apparently more rigid than the left. This

was most satisfactorily made out by using both hands, palpating the muscles simultaneously by employing at first but very slight pressure. As this was gradually increased, the right rectus could invariably be found under more tension than the left. In general, the rigidity of the abdominal muscles has appeared earlier and more extreme in degree than in cases observed by me of similar accidents occurring in the lower abdomen.

Facies.—That indescribable, yet pathognomonic, expression which speaks so eloquently of some serious intraperitoneal accident is invariably present in cases of this class and is a sign never lightly passed over by the surgeon of experience.

Temperature.—The temperature in these perforations has not been a reliable symptom. I have seen it subnormal a few hours after perforation, only to rapidly rise. Again, shortly after perforation an elevation of three or four degrees has been noticed, with a tendency to fall. The temperature in the cases of ruptured gall bladder has been uniformly high.

Pulse.—The pulse has also proven more or less disappointing as an early and pathognomonic index of the condition. Some patients, immediately following the accident, manifest marked shock, with a thready, running pulse. In others the pulse shows little acceleration until the signs of peritonitis are well marked, at which time all cases will present the characteristic pulse of peritonitis. As a rule, however, it may be safely said that the pulse rate shows a constant tendency to rise. I have never seen a case where every hour did not show a more rapid pulse than the preceding hour. As time elapses following the accident the well-known symptoms of widespread peritonitis become more and more apparent and are so familiar as to require no enumeration here. Suffice to say that in the class of cases under discussion their appearance is alarmingly prompt and only too well marked.

Diagnosis.—Beyond question the most important re-

sponsibility confronting the attendant in these cases is that of making an early diagnosis. The chance of the patient for recovery rests largely with the first physician called. If he, without attempting to analyze the symptoms and satisfy himself as to the pathology, allows his observation to extend no further than to determine that the patient has intense pain, which must be relieved, and proceeds to administer morphin, much harm will in all likelihood result. Although it takes more than the usual analgesic dose of morphin to relieve pain of this character, it may be so relieved, and patient and attendant lulled into a false sense of security thereby at a time when the attendant at least should be most keenly alert and acutely anxious to satisfy himself as to the cause of the difficulty. Too much can not be said against the too prevalent and really criminal practice of immediate administration of morphin to every patient with a bellyache. In attempting to make an accurate diagnosis in cases of this kind, the previous history of the patient will be of great value.

Between perforating duodenal ulcer and a severe and rapid appendicitis, the opinion of the observer may frequently hang in the balance. This is readily understood by recalling the fact that the fluid escaping from a perforation in the duodenum will follow the right colon into the pelvis, setting up almost immediately an inflammation of the peritoneum in the right lower quadrant of the abdomen, which tends to become quickly general, a course pursued also by many cases of fulminating appendicitis. Here the previous history may or may not be of benefit in attempting to differentiate. Careful examination will often reveal more tenderness in the upper than in the lower abdomen, and the muscular rigidity appears more marked above than below the level of the umbilicus. Liver dullness may be absent early, due to the presence of gas in the abdominal cavity. The character of the pain is also of value in the differential diagnosis. The pain in appendicitis is

generally more or less remitting in type, allowing the sufferer brief moments of freedom from its clutch, while the pain accompanying perforation of the stomach or duodenum is most intense and noted for its unremitting, constant torture of the patient. Between appendicitis and a perforating gastric ulcer the diagnosis, while often difficult, will not present so many obstacles. A previous history of ulcer may be frequently obtained, and the course of the extravasated fluid contents of the stomach toward the pelvis may be somewhat checked for a time by the transverse colon, which, acting as a dam, may in part retain the septic material in the upper abdomen or divert it to the left, where it follows the left colon into the pelvis. In such cases painstaking examination may show more tenderness and muscular rigidity in the upper abdomen, extending rather toward the left than to the right inguinal region. However, in other cases the fluid escaping from a perforation near the pyloric end of the stomach may follow the same course as that from a duodenal perforation, when the difficulties of differentiation are increased.

Between gastric, duodenal and gall-bladder perforation and those of the intestine complicating typhoid the history will decide.

The diagnosis between the perforations we are discussing and an acute hemorrhagic pancreatitis presents many difficulties and may frequently be impossible.

In attempting to differentiate between rupture of the gall bladder and a perforation of the stomach and duodenum the previous history of the case is of the utmost importance. A history of cholelithiasis extending over many years, punctuated now and then by attacks of acute cholecystitis and septic symptoms, together with the fact that the immediate shock of the accident is somewhat less marked, and the ensuing symptoms appear more slowly, would suggest the gall bladder as the seat of the difficulty. Liver dullness is not lost so early

in cases of gall-bladder perforations as in those involving the stomach and duodenum.

In striving to distinguish between perforating gastric and duodenal ulcer, according to Brunner, the most important features are the greater prevalence of ulcers of the duodenum in males and the fact that a history of alcoholism predisposes to duodenal ulceration. Also that in a perforation of the duodenum the extravasated fluid is more apt to follow the colon into the right inguinal region, with evidences of right-sided peritonitis, more marked in the lower abdomen and pelvis than on the left. Time will not permit the further consideration of this phase of the subject. While there are many other intra-abdominal conditions which must be distinguished from the perforations under discussion, I have attempted to mention those with which these accidents are most frequently confused. Those wishing to pursue this portion of the question further are referred to the excellent paper of Frederick Brunner, appearing in *Deutsche Zeitschrift für Chirurgie,* 1903, vol. lxix, to which article I am indebted for much assistance in this presentation of the subject. It will be seen from the above that the conditions for which these perforations are most likely to be mistaken are all serious and all demand immediate operation, and that while at times a differential diagnosis may be made, this at other times will be impossible. However, it is contended that the diagnosis of some grave intraperitoneal accident demanding surgical intervention can and should be made in every one of these cases. Valuable time should not be lost in hair-splitting argument as to the exact pathology. Open the abdomen at once and make the diagnosis and the repair at the same time.

Treatment.—The writer wishes to state his ideas of the treatment of these accidents, gained from an experience with six cases: Two of perforating ulcers of the stomach, one of the duodenum, and three ruptures of the gall bladder.

The diffuse peritonitis which follows the perforation so closely and which spreads so rapidly is the condition toward the relief of which the early and vigorous effort of the surgeon must be directed. Having decided that such a perforation is present, open the abdomen through the right rectus by a free incision from the ensiform cartilage to or below the level of the umbilicus. This will permit of whatever manipulation may be necessary in any case, as it allows free access to gall bladder, duodenum and stomach. Should the lesion be in the gall bladder, that viscus is immediately isolated from the peritoneal cavity by properly placed gauze packs, which prevent further soiling of the peritoneum by escaping fluid. If the gall bladder is gangrenous, necrotic or its tissues generally infected, it should be at once removed. If the cystic duct is absolutely closed, or the gall bladder shrunken and atrophic, with its capacity for storage destroyed, again is cholecystectomy indicated. In all cases where ablation of the gall bladder is performed, free liver drainage through a tube inserted well into the common or hepatic ducts should be provided for. It must not be forgotten at this stage of the operation that the greatest danger just now confronting the patient is the more or less diffuse peritonitis already present, and that prolonged manipulation engendered by the desire to make the operation a finished one will lessen resisting power and favor the spread of the peritoneal infection. We are often prone to do too much. In no class of cases will the penalty attached to prolonged, unnecessary surgery be more relentlessly enforced. Hence I favor saving the gall bladder, if possible, bringing it up and stitching it to the peritoneum in the wound, with the usual drainage, as this may be done with greater rapidity and with less manipulation than the more radical procedures. As the contents of the gall bladder in such cases are highly septic, extreme care should be taken that it is accurately united to the parietal peritoneum, leaving no chance for

subsequent leakage. Having disposed of the gall bladder, attention must now be given the general peritoneal cavity. It will be found more or less soiled, containing bile, mucus and seropurulent fluid, in quantity and character dependent on the degree of virulence of the extravasated cyst contents and the length of time elapsing since the accident. A two-inch incision should be made in the median line of the abdomen just above the symphysis, and through this a large rubber tube, one to one and one-half inches in diameter, split from end to end and carrying a gauze wick, introduced to the bottom of the pelvis. In females the posterior cul-de-sac should be freely opened through the vagina, the low abdominal incision rendering its accomplishment possible in a moment, and a similar tube introduced from the cul-de-sac into the vagina. The abdominal cavity should now be thoroughly washed out with gallons of hot salt solution, care being taken to reach all the fossæ and areas where septic fluid may lie more or less concealed. The upper incision is then rapidly closed with through-and-through sutures, leaving as much of the salt solution in the cavity as possible. Before tying the last suture more of the saline is introduced through a funnel to take the place of that which has escaped by way of the lower drains. The patient is then raised, while yet on the operating table, to a sitting posture, which is maintained while transferring him to his bed. He is placed, still in the sitting posture, in a bed, the head of which has been elevated at least thirty inches from the floor. I believe that leaving in the abdominal cavity a large amount of salt solution exercises a very beneficial effect, as this, together with the posture, establishes a strong drainage current in the right direction, that is, toward the lower pelvis, where it is easily taken care of by the ample drains provided. The indiscriminate and promiscuous introduction of tube or gauze drains here and there in various directions throughout the cavity is considered to be not only a useless, but a really harmful

practice. Such drains are rapidly shut in by adhesions, drain nothing and greatly increase the danger of post-operative obstruction. The lowest point of any cavity is the logical point to drain, and when by posture we insure the gravitation of the abdominal fluids to the lower pelvis free drainage at this point is both necessary and sufficient. Three cases of rupture of the gall bladder into the general peritoneal cavity have been treated as described above, with two recoveries and one death. A detailed description of the cases will be given below.

Perforation of the Duodenum.—Where the perforation is found in the duodenum, the affected portion should be isolated with gauze packs and the rent or rents immediately repaired. I prefer to make this repair with two layers of Lembert sutures of fine silk.

Perforation of the Stomach.—When the stomach is the organ affected, close search to find the perforation may be necessary. While perforations of the anterior wall of this viscus are seven times as frequent as those of the posterior wall, and while the lesser curvature is involved eight times to the greater curvature's once, it must not be forgotten that the perforation may be upon the posterior wall, or the greater curvature, and these areas, as well as the other and more susceptible regions of the stomach, should be carefully inspected in every case. The fact that more than one perforation may exist should be always borne in mind, and the examination never concluded, even though a perforation has been found and closed, until the entire stomach has been inspected. If necessary to facilitate the suture of the more inaccessible stomach areas, the incision may be extended toward the left along the costal margin. These perforations are also closed with interrupted Lembert sutures of silk in two layers. I do not favor the purse-string method of suturing visceral perforations. Having repaired the rent in the duodenum or stomach, some operators recommend a gastroenterostomy to insure the future welfare of the

patient. To this advice I wish to take decided exception. When we have a patient with an acute diffuse septic peritonitis, he will have no future unless we give him every chance, and to give him that we must do as little to him as possible. If we by timely, quick and proper interference can tide him over the dangers of the acute infection, we can make the gastroenterostomy, should one be necessary, at a later and more favorable time. Again, it seems proper to insist that these patients can not and will not stand prolonged operations. We should always attempt to do just enough—never too much. After having sutured the perforations in duodenum or stomach, attention must be given the peritoneum. Here, again, we will find more or less evidence of a rapidly spreading inflammation, with more or less septic fluid present. From now on the steps of the operation are exactly the same as described above, everything being done systematically and as rapidly as possible.

One perforation of the duodenum and two of the stomach due to ulcer have been so treated, all the cases recovering. Reports of the cases mentioned in this article follow:

Case 1.—Rupture of gall bladder into general peritoneal cavity. No adhesions. Operation, sixteen hours after rupture, following technique described above. Recovery prompt and uneventful.

Case 2.—Seen with Dr. Cruickshank, of Vermilion, S. D. Rupture of gall bladder into general peritoneal cavity. Operation, twenty hours after rupture. Same technique. Recovery slow and for a time doubtful, but finally complete.

Case 3.—Mrs. E., aged 39. Seen with Dr. Scott, of Paulina, Iowa. History of gall stones for eight years. Of late the "attacks" had become more frequent and severe until the present one, which began ten days ago. This was accompanied by more pain than usual, with evidences of sepsis prominent from

its inception. For the past twenty-four hours symptoms of diffuse peritonitis present. Pulse 115; temperature, 102.5°. Abdomen distended and tender, but patient did not complain so bitterly of pain as the preceding cases. Immediate operation disclosed a large collection of bile-stained, purulent fluid about the gall bladder, evidently confined by the many adhesions present in what was thought to be a sharply circumscribed area. This idea led to a fatal error in technique. Disregarding the symptoms which, prior to the operation, had spoken plainly of a diffuse peritonitis, I proceeded under the assumption that it was a localized infection, and after carefully mopping out the cavity placed therein free tube and gauze drainage. The gall bladder full of stones was not disturbed, as I feared its manipulation might separate some of the protecting adhesions. It was confidently expected that the symptoms of acute sepsis would now rapidly subside, when with a clean wound the operation could be completed. The symptoms of diffuse septic peritonitis continued unabated after the operation, and death occurred forty hours later. It was now apparent that I made a very grave mistake in the conduct of this operation, as leakage was taking place from this presumably walled off, area into the general peritoneal cavity, and the marked symptoms pointing to such an accident should not have been crowded out of consideration by the local findings. I shall ever regret that the same technique employed in the preceding cases was not made use of here.

Case 4.—Perforating gastric ulcer. Seen with Dr. McLaughlin, of Sioux City. Two perforations of anterior wall of greater curvature of stomach, with extravasation of stomach contents into general peritoneal cavity, were found at the operation, which was made sixteen hours after perforation, following usual technique. Recovery was uneventful.

Case 5.—Perforating gastric ulcer. At the opera-

tion, made twelve hours after perforation, a single perforation along lesser curvature was found. Extravasation into general peritoneal cavity, with extensive soiling. Recovery.

CASE 6.—Perforating duodenal ulcer, seen with Dr. Garver, of Sioux City. Operation, fifteen hours after perforation, revealed small perforation of anterior wall of duodenum, one inch below pylorus. Soiling of peritoneum general and widespread. Recovery.

DISCUSSION.

DR. H. C. CROWELL, Kansas City, Mo.—It must be obvious to all present that something is either wrong or too near right. We have had very few discussions, and for the reason that the papers have been so amply correct that there is no opportunity for discussion.

This paper, in my judgment, is excellent and completely covers the subject, so that it leaves very little opportunity to add anything of interest. I do not rise at this time to discuss the paper, but to tell the essayist he made a mistake if he expects discussion on a subject that he has covered so completely.

There is one thing in regard to all of these operations that should be borne in mind, and the final conclusion seems to be that an exploratory incision is the final outcome of every one of them. They must of necessity almost become exploratory, and the thing for which we should strive with a greater degree of precision in the future than in the past is to make every exploratory operation a lesson to point out the cardinal features of certain conditions in such a way that they may be more readily and clearly recognized prior to making these incisions, thus rendering them less frepuent.

This association, like many others, is growing to be a surgical society, and the gynecologic part of it is becoming more or less obscured. At any rate, that seems to be the tendency. But I submit that painstaking diagnoses, in the early history of abdominal surgery, have been developed and have come through the gynecologist, and to-day the mechanical part of it which has been introduced, I must say, very largely by the general surgeon, in the way of exploratory incisions, is doing away very largely with the effort

to discriminate and to differentiate the essential cardinal features. That may not be accepted by many, but I believe it is borne out by the facts, if we review the history of abdominal surgery; so that while I do not wish to discuss the particular features which the essayist brought out, I do believe we should emphasize more particularly the feature that every exploratory incision demonstrates, and to establish certain well-defined cardinal principles that may be of service in the recognition of these conditions.

DR. E. M. SALA, Rock Island, Ill.—I would like to ask Dr. Knott what his objection is to the purse-string suture, and if he does not think it is very useful, provided it is reinforced with Lembert suture?

DR. ARTHUR E. HERTZLER, Kansas City, Mo.—I would like to say a few words in regard to the pathology of perforations in the upper abdomen in connection with and in extension of the remarks I made yesterday.

The usual reason given for the greater prevalence of perforations above is, as we have just heard, the greater virulence of the bacteria in this region and various other factors. Now, as a matter of fact, which I have had occasion to observe, the bacteria are fewer and less virulent above than in the lower intestinal tract. In my remarks yesterday you may remember I stated that experiments have proven that the greater virulence depends upon less tendency to form adhesions. I think clinical experience has shown that to be true in the practice of the members present. The real reason, I am convinced, is that in the upper region of the abdomen the digestive ferments are active, while below they are absent, particularly in the large intestine. The digestive fluids secrete an active pro-ferment, and it is probably the latter which prevents the formation of adhesions. The researches I carried out prove that. The way to do is to make an incision in that part of the digestive tract which is to be studied; draw up a loop of intestine, and tie a rubber ligature about it (this I had taken from McGraw), and if I allow that to slip back a couple of inches, closing the original wound, which would give an interval of time for it to heal before the ligature had made an artificial perforation in the intestine below, adhesions would invariably occur more readily the farther I get from the active digestive ferments.

The point of the greatest digestive ferment activity is in the region of the duodenum, and it seems to me to make little difference whether they be pancreatic, stomachic, or intestinal ferments. It is the constant action of this ferment in the bases of these ulcers which prevents the formation of adhesions when they perforate. These ferments, I am convinced, account for the greater severity of the conditions in the upper abdomen, leaving out, of course, the difference of absorbability in the upper abdomen, as pointed out by Muscatello a number of years ago.

Dr. D. S. Fairchild, Des Moines, Iowa.—The general discussion of the symptomatology and the course of procedure in perforations of the upper abdomen has been so well covered, that there is little or nothing to discuss. There is one point, however, that should be mentioned, and that is in relation to the leakage which occurs from these ulcerations and the formation of adhesions which mask the symptoms and which lead to serious results later.

A few years ago a case came under my observation in which there was a perforating ulcer of the duodenum. It apparently had leaked very little, and adhesions were formed with the hepatic flexure of the colon, and for three weeks the symptoms were those chiefly of obstruction. The patient came under my observation at the end of that time, and the case was operated upon under a mistaken diagnosis of obstruction of the bowel. The inflammation spread over the peritoneum of the colon, followed by paresis, and it was believed, before the operation was made, the case was one of intestinal obstruction. Undoubtedly, we meet with a greater or less number of patients of that kind, where a mere leakage occurs, adhesions form, and the ulcerated surface becomes larger, and we have a type of symptoms altogether different from those pointed out in the paper, and the question comes up whether the operative procedure should not be different in those cases where the products of the trouble are walled off by adhesions which have formed. I do not understand that the essayist would open and tear up any adhesions, or treat the case as he would one where an acute perforation had taken place, with the cavity being flooded with contents of the organ itself.

Dr. A. E. Benjamin, Minneapolis, Minn.—I was

very glad to hear the doctor (Dr. Hertzler) speak about the different character of the bacteria in the upper and lower portions of the abdomen. That is a factor which has not been brought out before, and it is an important one. I have always considered it so, and while my experience may not have been as great as a number of others here, still my observations have been similar. The thin fluid that escapes after a perforation may gravitate to other regions of the abdominal cavity. For instance, it may extend along the transverse or lateral portions of the colon, consequently more tissue is involved and more infection results, so that a diffuse peritonitis may result. I would think that would be one factor in the extent of the inflammation following perforation.

Dr. Jabez N. Jackson, Kansas City, Mo.—I simply want to make a remark relative to the technique. The essayist, if I understood him correctly, advocated, without qualification, a very thorough and complete flushing of the abdominal cavity in all cases of perforation. This is advice which, unless qualified, would lead us into error.

Dr. Fairchild has called our attention to the fact that we may have a number of perforations in which the amount of leakage is so small that, as a rule, the perforation becomes closed by circumscribed adhesions, and that we have in subsequent operations found distinctly circumscribed lesions enveloped in adhesions. Therefore, inasmuch as it is true that we have perforations which, if operated on in the early stage, with a comparatively small amount of leakage, and the leakage being particularly in the upper abdominal cavity, and limited in the early stages to the distinctive foci within which the leak occurs, under the circumstances it is quite unnecessary, and even deleterious, to fill the abdomen with water and flush it. I think this should be qualified in this way, that flushing of the abdomen should be restricted absolutely to that class of cases in which there has been free fluid in the abdominal cavity, with the contents of a ruptured viscus.

I had this illustrated very nicely in a very recent case of perforation of the stomach from a gunshot wound. The patient came under my observation within three hours after the injury had occurred, and to my surprise, on opening the abdomen there was apparently

very little leakage, although the wound in the stomach was made by a 44 caliber bullet. After walling off the immediate area and drying it, and excising the area of the gunshot wound, and closing it, I wiped the surrounding area and closed the incision without any drainage whatever. The subsequent course of the case was uneventful. I do not wish to convey the impression that no case of perforation of the abdomen should not be thoroughly flushed, but thorough flushing of the abdomen should be restricted. I believe the tendency is more and more to use less drainage in the abdominal cavity, and we know that if by a dry sponge friable material is cleansed from the peritoneal surface, the peritoneum itself is able to care for quite a little infectious material, when any possibility of continuous manufacture of infection is removed, and inasmuch as when we close these wounds we shut off the possibility of new material escaping; if we can sponge the parts dry, that is all that is necessary, as a general rule, unless we have a large opening which is made by a rupture, with evidence of considerable of the contents having escaped into the general abdominal cavity.

DR. WILLIAM E. GROUND, Superior, Wis.—My experience with regard to flushing of the abdomen is that it has been carried too far. I think the cases where flushing is indicated are very rare. The point, it seems to me, is to stop the source of infection—perforation—with the least possible manipulation and injury to the peritoneum, and then close the wound. Prolonged flushing and manipulation in these is certainly detrimental, and if the source of infection is stopped and the abdomen closed, little flushing or drainage is necessary. The uninjured peritoneum, as we all know, will take care of much septic material, and it has always been a question in my mind whether or not those cases that were flushed would not have better recovered without it. Still I believe the glass drainage tube in the pelvis and the patient in the Fowler position has its usefulness and I often use it when there is general infection of the peritoneal cavity.

DR. KNOTT (closing the discussion).—In reply to the remarks of Drs. Jackson and Fairchild, I wish to call to their attention the title of the paper, which they have evidently overlooked. They are talking of localized septic processes, the product of chronic perfora-

tions. The term acute perforation is taken to mean a perforation occurring so rapidly that time for the formation of limiting adhesions is not allowed, and following the perforation extravasation of septic material takes place into the general peritoneal cavity. This cavity rapidly becomes soiled throughout its entire extent and its cleansing is a matter of necessity. The treatment of a localized abscess due to the chronic perforation is entirely another story, and the gentlemen are perfectly correct in describing the method of treatment of that condition, as no good surgeon would recommend the breaking up of such adhesions with the prospect of transforming a local infection into a general one. Another comparison made by Dr. Jackson does not fit the case. We are discussing the treatment of pathologic perforations made from within out, not traumatic perforations made from without in. In the former, the mucosa being destroyed over quite a large area, forms a funnel-shaped wound with the large end inside, and when finally perforation of the serosa occurs there is nothing left in the way of tissue to plug the wound and free leakage usually occurs. On the other hand a gunshot perforation occuring instantaneously may not do much damage to the elastic mucosa, and we have all frequently seen such wounds almost, or even entirely, plugged with the mucous membrane and extravasation being thus limited or prevented. As to flushing the abdomen. In my experience five cases out of six recovered after such treatment. The cases were all serious. If those who do not favor flushing the cavity can show a better percentage of recovery in the same class of cases I am willing to listen to their method. If they can not I see no reason for changing my technique. In reply to the remarks of Dr. Sala, it may be my own awkwardness, but I have never been able to make so satisfactory a closure of a visceral perforation with the purse-string suture as I can make with a double layer of Lembert sutures of fine silk, which are applied with equal rapidity.

PNEUMATOCELE OF THE CRANIUM.

L. L. McARTHUR, M.D.
CHICAGO.

In calling attention to pneumatocele of the cranium I do so not with the idea of conveying some new or important information or advanced treatment, but rather to recall to mind a decided rarity, if we may judge from the few recorded cases, and to make easier, perhaps, the recognition of future cases.

What I can at least offer is the record of an additional case and a thorough résumé of the literature, which I will present as briefly as possible, with a synopsis of all recorded cases. These number as yet but 33, of which 23 were occipital, 10 frontal. With a full bibliography added it will be an easy matter in the future to make reference to this subject.

Patient.—A. C., aged 63, was admitted to the hospital May 26, 1902, and was operated on June 17, 1902.

History.—Two years ago the patient noticed a small tumor mass about the size of a bean just above and behind the ear; it grew to the size of an egg. It was lanced by Dr. Frank, but reappeared in four days and since has gradually grown to the present size. When the tumor is pressed the patient says "it feels like air coming from the ear." He has pain all the time over the tumor. He says that he can not hear from left ear; he never had earache.

Examination.—His general appearance is that of an aged man of good build. His muscular system is somewhat flabby.

Head: The eyes react to light and to accommodation. The right eye has a nebula on the cornea; the left eye has pterygium extending over the edge of the cornea.

Mouth: The upper teeth have nearly all disappeared except for a few roots. The tongue has a whitish coating.

Cranium: Over the left portion of the cranium, over the posterior inferior portion of the left parietal bone, over nearly

the entire occipital bone and over the posterior portion of the left temporal bone is a large bulging tumor. The scalp covering is very tense but can be compressed against the bone beneath. A hollow tympanitic note is elicited on percussion. There is no fluctuation and no pulsation. The bone beneath seems thinned, and in some places small fragments can be

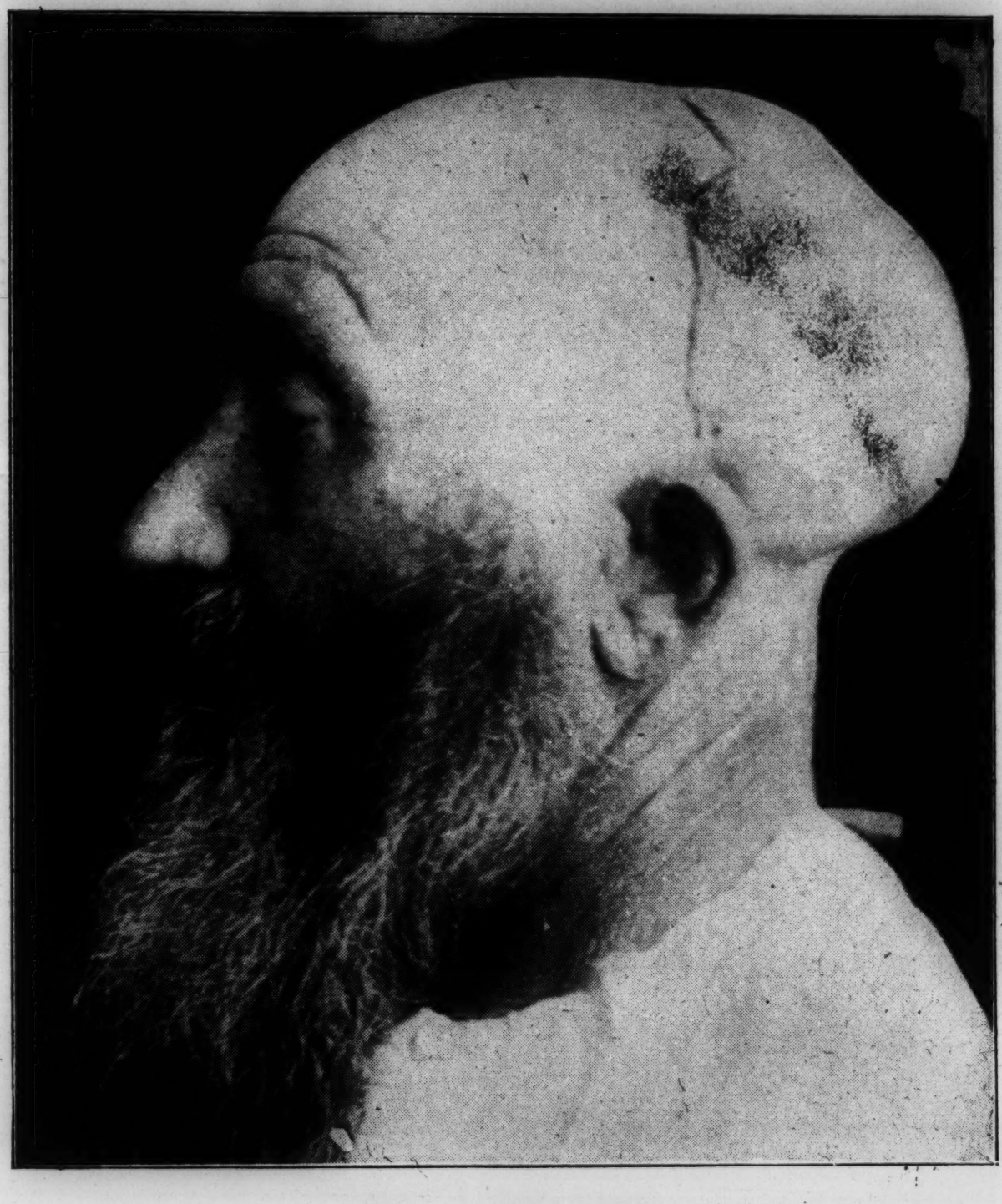


Fig. 1.—Side view.

moved about. No cerebral symptoms appear when pressure is exerted on the scalp. The contents of the tumor are not reducible. There are three areas where the bulging is more marked, as if there were separate compartments, and there is some pain on pressure.

Thorax: The chest is large and barrel-shaped. Respiratory excursions are somewhat restricted. There is a prolonged expiratory sound, but no râles.

Heart: The area of dullness is diminished, and is covered by lung tissue. A loud systolic murmur is heard over the entire chest with its maximum intensity along left border of sternum.

Abdomen: Negative.

Left Inguinal Region: There is a large oblique inguinal hernia which is easily reducible. A distinct impulse is imparted. There are very large external and internal rings.

Extremities: In the left lower extremity there are evidences of a previous osteomyelitis of femur. There are a number of cicatrices on thigh. The knee and ankle are both ankylosed, and

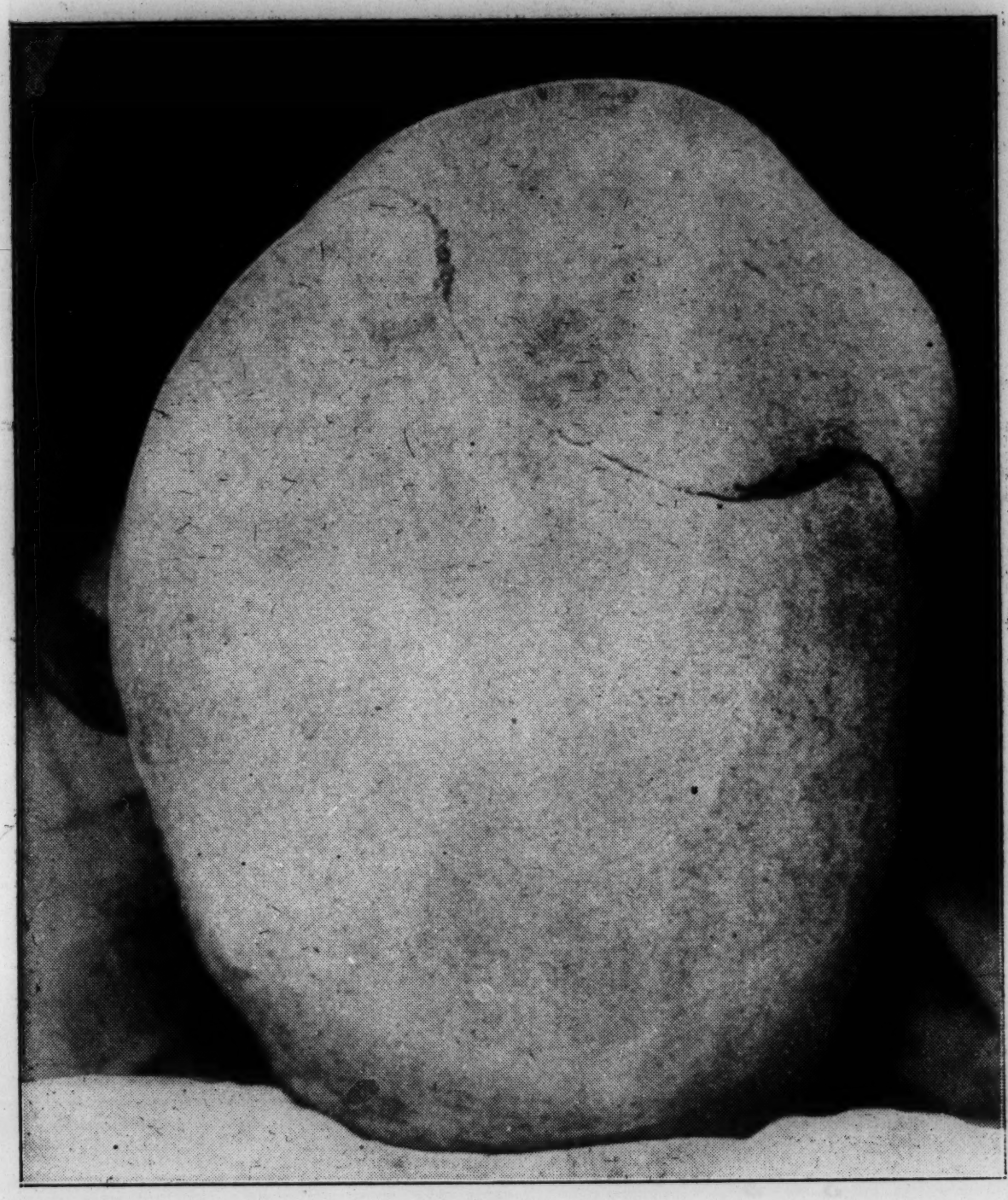


Fig. 2.—View from above (forehead resting on table).

there are a number of scars around the ankle. Reflexes are sluggish.

Glandular system negative.

Operation.—A long incision was made over the tumor mass, on the left side of the head, from the mastoid process toward the parietal eminence. As the incision was continued in depth the entire mass collapsed, the contained air escaping. Underneath the scalp and springing from the bony vault were numerous exostoses, giving a honey-combed appearance to the

cavity. These exostoses were chiseled away and removed. At the mastoid process an excavation was found with a fistulous tract which, on being probed, could be distinctly felt to lead through to the external auditory canal. Considerable hemorrhage was encountered, one vessel deep in the bone requiring tamponing to arrest its bleeding. A counter opening was made in the scalp toward the right side. A large strip of iodoform gauze was packed through this opening and through into the first opening. The entire wound was left open and packed with iodoform gauze. A recurrent head bandage was applied. The patient was in good condition on being put to bed.

June 18, wound redressed; June 19, wound repacked; June 21, packing partially removed; June 23, remainder of packing removed; June 25, head redressed; June 27, head redressed; wound packed with iodoform gauze; Thiersch dressing applied; June 29, head redressed; discharge somewhat purulent; July 1, head redressed; July 3, head redressed; July 4, head redressed; July 6, head redressed; discharged.

DEFINITION.

Pneumatocele may be defined as a gaseous tumor of the cranium, a term proposed by Chevance de Wassy as being the more proper surgical name with which to replace that of *"tumeur gazeuse"* or *"tumor flatulans,"* that had been used in the four previously recorded cases. The term should not be confused with the condition now described as emphysema of the scalp, from which it differs in being one air-containing sac, while emphysema consists of numerous finely divided bubbles of air in cellular tissue. Nor should it be confused with pneumocele, which applies only to hernia of lung.

These tumors have for their external wall the skin and periosteum and all tissue between. They have been observed almost invariably in two positions. First, over the mastoid region and occiput; second, over the frontal sinus and forehead. By some authors they are described as pneumatocele occipitalis and pneumatocele sincipitalis.

DIAGNOSIS.

For developmental reasons these tumors are never found in the first decennium of life.

They vary in size according to their age. They have been described from the size of a hazel nut to an enlarge-

ment sufficient to give the head a circumference of 2½ feet. Because of the varying degrees of attachment of the periosteum to the bone they assume irregular shapes, giving a grotesque appearance to the patient, as accompanying photograph will demonstrate. The irregularity is chiefly determined by the stronger attachment of the periosteum at the sutures.

When complications are absent, the tissues covering these tumors retain a normal appearance, neither reddened, edematous nor inflamed.

These tumors are not usually sensitive when palpated, and give a sense of extreme elasticity or of exaggerated fluctuation. They do not pulsate. On pressure, such as might be used to reduce a meningocele or to collapse an angioma or varix, the tumor mass often will diminish in size. The patient frequently hears a sound as of rushing air or water in the ear when the tumor is occipital, and in the nose or throat when frontal. When tense, the tumor gives such a sense of fluctuation that the surgeon frequently thinks that he has to deal with a fluid collection. This idea is opposed by the finding of a bony outgrowth or ridge at the line of juncture of tumor with the normal scalp, for if the tumor has existed for some time there will be found a distinct bony elevation rising from the normal cranial wall on to the surface of the tumor to the distance of from one-fourth to one-half inch. The margin of this ridge which joins the elevation is serrated, sharp and irregular. In those cases in which the size of the tumor can be reduced by pressure one can also feel through its coverings numerous bony irregularities, elevations and depressions over its entire base. Efforts on the part of the patient to inflate the middle ear, or the use of the Politzer bag, will usually restore the size of the tumor. It is sometimes possible after the temporary reduction by pressure of one of these tumors to feel the opening into the sinus of the mastoid process. They are dependent for their occurrence on connection with air-containing sinuses.

Auscultation is negative. Percussion offers the most important diagnostic sign, for one obtains thereby a highly exaggerated tympanitic note. In this location, however, percussion is the procedure in the examination least likely to be made, for one expects to obtain no other than a flat note and therefore omits the test.

PATHOLOGIC ANATOMY.

Pneumatoceles, then, being tumors produced by air dissection of the periosteum from the bone, will have for one-half their lining periosteum, for the other half bony wall. This periosteum, being normal, retains its natural ability to produce bone. Hence, at the junction of the periosteum with the calvarium a bony ridge forms. This ridge marks the outlines of all long-standing pneumatoceles. From varying points of the thus elevated periosteum strands of tissue still connected with the bone remain. Along these strands osteophytes may form which, if the tumor be opened, will appear like stalactites and stalagmites, and in this way are produced those irregularities that can be felt when the tumor has been collapsed by pressure.

The air entering into the formation of these tumors, just as in the analogous condition of emphysema, is usually sterile and therefore remains as a simple non-irritant.

Chevance de Wassy and others took pains to have careful analyses made of the contained gases and found them to consist of nitrogen 87 per cent., oxygen 10 per cent. and carbonic acid gas 2 per cent. The proportion of oxygen, being small, led him to believe that the gaseous mixture was not air.

We now know, experimentally, that if air be injected into one of the body cavities its oxygen will be readily absorbed, while the nitrogen remains for a long time. It is probable that air so injected, by a process similar to the exchange of gases in the lung, would gain in carbonic acid gas what it lost in oxygen. This the in-

vestigations of LeComte have experimentally demonstrated.

ETIOLOGY.

In the few exhaustive memoirs on this subject, the writers have considered the various modes of formation of these tumors. The more logical deductions have pointed to a destruction of the bony walls, traumatic, inflammatory or spontaneous, and have rather dismissed as untenable both the congenital defect idea and that of an escape of air through vessel foramina. Theoretically, it is conceivable that the bony wall of either the frontal sinus or of the mastoid cells could be of such parchment-like thinness congenitally as to give way under unusual pressure from within or without. We do know that in later adult life the walls of these cavities atrophy or become so thin that this could occur, and possibly some of the pneumatoceles described as spontaneous may have had such an origin. The suggestion by Helly that it would be possible for gas to escape from either frontal or mastoid cells through vascular bony foramina seems unlikely, for, during the existence of the blood vessels, these foramina would be filled by them, and in processes which resulted in vessel obliteration there would be left behind the obliterated structures to occlude the foramina. It sometimes happens that the squamous mastoid fissure in the process of development fails to unite, and in such a way one case is believed to have been caused. In one case (Kramer) the pneumatocele was found over the occipital prominence. At the operation, after careful search, the air was found to have followed along the bony suture to that point from the mastoid process.

While the real causes in a few cases are obscure, in the great majority of cases we have one of two etiologic factors that can be elicited by the clinical history: 1, trauma; 2, sudden increased pressure within the buccal and oral cavities. The trauma in 10 cases has been by direct violence; in 10 cases by the changes which in-

Author.	Location of Tumor.	Sex and Age.	Special Senses Affected. Dizziness, Etc.	Origin.			Treatment.	Result.
				Traumatic.	Inflammatory.	Spontaneous.		
Lecat, 1741....	Began below right ear, later covered two-thirds of skull.	?	Hearing (?)...	.....	.....	Unknown. "Scrofulous t'mp'ram't." Cause unknown.	Large incision; caustics..	Death after 133 days from sepsis.
Olof Acrel, 1777	Over frontal to malar bone.	Boy.	"Heaviness in head."	.....	.....	After lifting heavy w'ght.	Pressure	Recurrence on removal of pressure.
Lloyd, 1779....	Junction of sagittal and lambdoidal sutures.	F 35	Dullness, stupor, vertigo.	Fell from horse eight years previously.	.....	. . . . .	Incision; lint poultice. "Healed in 3 weeks."	Recurrence after 7 months, finally cured.
Pinet, 1833.....	Occipital; later like "enormous turban."	M 33	?	.....	.....	"No appreciable cause."	Successive punctures, incision and setons later	5 months later still carrying seton. All but small area adherent.
Chevance de Wassy.1850-51	Behind left ear. Extended later over vertex nearly to right ear.	M 33	Hearing. "R'mbli'gs" in the ear.	Fall from tree "resulting in fracture of wall of tympanum" (?); ("Of 'Rocher' at level of ear drum.")	.....	.....	Punctured at first, later opened and seton inserted. Abundant suppuration.	Recurrence after 2 months, seton again and after short time complete cure.
Belassa, 1853..	Right side of head. Later another over parietal bone.	M 16	Hearing.....	.....	.....	"Lymphatic constitution."	Incision, permanent gutta percha canula. Compression.	Erysipelas and abundant suppuration followed by cure after from fifteen to twenty weeks.
Voisin, 1858...	"Back of right ear." Became occipital and parietal.	M 57	None mentioned.	.....	.....	"Painless development."	Incision and compression	Suppuration with final cure.
Costes, 1859...	Over right ear; occipital.	M 57	None mentioned.	.....	.....	"Painless swelling."	Incised, lint wick, suppuration.	Cure.
Guthrie	Frontal.....	?	?	"Frontal sinus wound."	.....	.....	Compression.....	Result not stated, probably negative.
Duverney	Frontal "to middle of nose."	F	Smell ?.....	.....	Inferior maxillary and nasal bone necrosis.	.....	Incision.....	Cure after 12 days.
Sante Foi	Frontal, extended below orbit.	F 12	Smell ?.....	.....	Nasal inflammation.	.....	Compression.....	Cure after 6 weeks.
Ribeiro, Vianna, 1862.	Occipital, began behind left ear.	M 20	.....	.....	Slight auditory canal inflammation following "prick" some mos. before.	.....	Cross incision and curette; cure for 3 mos., reappearance followed by compression.	Recurrence.
Warren, 1862..	Frontal	?	? Pain in side of head.	Blow on head by tree four years before. Irregular loose masses of bone.	.....	.....	Several operations, removal of bone fragments.	Not known. "Condition poor when last seen." "Brain symptoms at times." "Recovery after removal of last fragments."
Denonvilliers 1866. Rep'ted by Thomas.	Right occipital, over large area.	M 29	"Bruit." Later some deafness in right ear. A previous attack of vertigo and unconsciousness.	Kicked in he'd by horse at 12 years of age; later head symptoms.	"Never had otitis."	.....	Trochar, compression....	Small local swellings persisted, also occasional attacks of vertigo.
Fleury, 1867-68	Occipital, mastoid right.	?	"Bruit" vertigo.	"No history of trauma."	"No infection."	Evidently.....	Puncture, lint; became purulent.	Death, following edema of face and throat.
Jarjavay, 1869.	Right frontal, extended to border of occipital.	M 25	Sight and smell affected; hearing intact; headaches and vertigo.	History of severe fall 7 years previously.	.....	Headaches (frontal) from 9 years of age.	Punctures, incision and canula. Abscess and counter openings.	"Cure, but there remained a permanent fistula to frontal sinus."
Krabinski, 1869	Frontal left.....	M 46	Sight (from swelling).	.....	.....	Spontaneous at first; recurrence attended by nasal and frontal sinus inflam'ation.	Puncture drain and compress. Later a small "pelotte" was applied and fastened by rubber band. Later recurrence, sequestrum removed. Large compress.	Probably not a cure.
Schmidt, 1871.	Mastoid occipital.	M	Hearing ?.....	.....	Typhus and otitis media; irrigations, etc. Politzer and Valsalva's procedures.	Says exact cause not known.	Pressure bandage.....	"Cure after 8 days."
Wernher, 1873.	Mastoid occipital; "whole right half of hairy part of head."	M 20	"Noises." Hearing somewhat impaired.	.....	.....	Evidently, though followed by violent sneezing	Iodin injections.....	Cure.
Mazzoni, 1874.	Behind ear. Left occipito-parietal boundary.	M	"Hearing intact."	.....	.....	Evidently.....	Drain and "cerat" plaster pressed down on skin.	Recurrence; probably not final cure.
Birnbacher, 1881.	Frontal (right)...	M 17	No interference with vision.	.....	Frontal sinus disease	.....	Puncture and drainage..	No return for 2 years.
Brunschwig, 1883.	Above and behind ear, right side.	F 15	.....	Swelling increased after a fall on head.	Also accentuated by "cold in head."	Spontaneous at first.	Repeated punctures and compression.	Cured.
Turner, 1888...	Over right mastoid process.	F 20	Audition negative.	Fell from sofa and struck right side of head, 2 years before.	.....	.....	Incision, irrigation with 4 per cent. carbolic acid solution. Tampon of iodoform gauze; compression. Drain removed 5th day.	Complete cure after 13 days.
Sonnenburg, 1889.	Behind right ear. "More over parietal bone."	F 12	Evidently none	.....	.....	No cause known.	Long incision and tampon.	Cure after some weeks.
Von Helly, 1890	Left side over frontal bone.	M 28	Headaches....	Blow over right eye 7 years before, followed by loss of vision	Nasal discharge 3 years before; later ozena and erysipelas.	.....	Left hospital when erysipelas disappeared.	"Appeared to be a complete cure."
Kramer, 1896..	Occipital "Opening more than centimeter back of mastoid."	M 28	"Hearing normal."	Blow in back of head four weeks before	.....	.....	Incision, compression; recurrence. Iodin and gauze, recurrence; plastic with flap.	No recurrence for 6½ months.
LeDentu, 1896	Frontal	M	.....	Fracture of skull by fall 20 days before.	.....	.....	Incision, some pus trephined.	Not known.
Lannois, 1897.	Mastoid. "Swelling back of ear."	31	?	.....	Suppuration in ear for several yrs.	.....	Tumor became inflamed..	Unknown.
Nove. Josserand and Carle,1897-98.	Mastoid both sides, right the larger.	M 31	"Very nervous." Vertigo marked; slight deafness.	.....	"No evidence of mastoiditis."	Neuralgic pains about ears at 11 years; no discharge.	Incision was followed by air bubbles and small amount of pus. Antiseptic dressing.	"Radical cure." "Case of inflamed pneumatocele."
Malapert, 1900 ('85).	Right mastoid....	M 44	Hearing impaired.	.....	Purulent discharge from auditory canal sometime before.	.....	Considered an abcess and lanced.	Not known.
Martel, 1901...	Occipital. Began as two tumors, one in temporal region.	M 26	Impaired audition, headaches and vertigo.	.....	.....	Evidently	Punctured at first; recurred later; drainage by seton with counter drain, compression. large opening later; external plate removed and mastoid process uncovered, iodoform gauze and tube for drainage. "Minerva" later applied.	"Left hospital on road to recovery."
Strom, 1902....	Left temporal and parietal.	M 19	Hearing somewhat impaired.	.....	"Catarrh in nose for years."	.....	Bow shaped incision; curette and chisel, removed outer lamella of mastoid process, drainage	Cure. (No return in 2 years.)
McArthur, 1904	Left occipital and parietal.	M 63	Impaired hearing.	.....	.....	Spontaneous..	A former puncture with recurrence. Incision, chisel and curette, wound left open and packed with iodoform gauze.	Cure. No recurrence in 2 years, still has impaired hearing.

Total: 33 cases. Location: 23 occipital; 10 frontal. Sex: Male, 22; female, 6; unknown, 5. Age: 12 to 66 years. Traumatic history, 10; inflammatory history, 10 (3 traumatic also). Spontaneous, 16. Result: Cure, 17; recurrence, 6; doubtful, 8; death, 2.

Author.	Location of Tumor.	Sex and Age.	Special Senses Affected. Dizziness, Etc.	Origin. Traumatic.	Origin. Inflammatory.	Origin. Spontaneous.	Treatment.	Result.
Lecat, 1741....	Began below right ear, later covered two-thirds of skull.	?	Hearing (?)...	.....	.....	Unknown. "Scrofulous t'mp'ram't." Cause unknown.	Large incision; caustics..	Death after 133 days from sepsis.
Olof Acrel, 1777	Over frontal to malar bone.	Boy.	"Heaviness in head."	.....	.....	After lifting heavy w'ght.	Pressure	Recurrence on removal of pressure.
Lloyd, 1779....	Junction of sagittal and lambdoidal sutures.	F 35	Dullness, stupor, vertigo.	Fell from horse eight years previously.	.....	. . . . .	Incision; lint poultice. "Healed in 3 weeks."	Recurrence after 7 months, finally cured.
Pinet, 1833.....	Occipital; later like "enormous turban."	M 33	?	.....	.....	"No appreciable cause."	Successive punctures, incision and setons later	5 months later still carrying seton. All but small area adherent.
Chevance de Wassy. 1850-51	Behind left ear. Extended later over vertex nearly to right ear.	M 33	Hearing. "R'mbli'gs" in the ear.	Fall from tree "resulting in fracture of wall of tympanum" (?), ("Of 'Rocher' at level of ear drum.")	.....	.....	Punctured at first, later opened and seton inserted. Abundant suppuration.	Recurrence after 2 months, seton again and after short time complete cure.
Belassa, 1853..	Right side of head. Later another over parietal bone.	M 16	Hearing.....	.....	.....	"Lymphatic constitution."	Incision, permanent gutta percha canula. Compression.	Erysipelas and abundant suppuration followed by cure after from fifteen to twenty weeks.
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Costes, 1859...	Over right ear; occipital.	M 57	None mentioned.	.....	.....	"Painless swelling."	Incised, lint wick, suppuration.	Cure.
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Sante Foi	Frontal, extended below orbit.	F 12	Smell ?.....	.....	Nasal inflammation.	.....	Compression.....	Cure after 6 weeks.
Ribeiro, Viana, 1862.	Occipital, began behind left ear.	M 20	.....	.....	Slight auditory canal inflammation following "prick" some mos. before.	.....	Cross incision and curette; cure for 3 mos., reappearance followed by compression.	Recurrence.
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flammatory processes within these bony cavities could easily induce—that is, the outer bony shell can be easily fractured without tearing the periosteum, or can be readily absorbed by inflammatory processes, can become carious, or can disappear by direct pressure from granulation tissue or new growth, leaving the periosteum intact. When to such a condition we have the added factor of a sudden decided increase in the air pressure within the mastoid or frontal sinus, this intact periosteum may be elevated and dissected loose by the burrowing influences of the escaping air, and finally there may result the formation of a tumor of varying size and form, the contents of which is simply air.

Instances are related in which sudden violent efforts, as in the case of a baker lifting a barrel of flour, or a hostler struggling with a vicious horse, have made the increased pressure necessary to make the bony wall give way—or, if already missing, to elevate the periosteum. Nevertheless, 16 (about 50 per cent.) of the cases collected have occurred spontaneously so far as history of injury or of inflammatory conditions go.

During the growth of the tumor the patient not infrequently will hear—on efforts at sneezing or blowing the nose or inflating the ear after Valsalva's method—the escape of air into the tissues back of the ear, with a corresponding increase in the size and tension of the tumor. He will sometimes call attention, too, to the possibility of reducing this by a reverse process of pressure on its surface. It is easily conceivable why many of them can not be so reduced, for the periosteum lying over the mastoid or frontal sinus may remain so nicely in apposition with the opening through which the air escapes that it will act like the valve of a bellows or Davidson's syringe—rising readily to permit ingress of air to the tumor cavity, but falling flatly against the orifice to prevent its exit.

The partially collapsed tumor can be artificially filled with air by use of the Eustachian catheter and the

patient himself may accomplish the same result by attempting to blow hard when his nose and mouth are closed.

TREATMENT.

Since the majority of these tumors were observed in the pre-antiseptic era, it is easily understood how considerable differences of opinion arose as to the best methods of handling a growth perfectly benign in itself, but capable of very disastrous results if not protécted against infection. The following procedures have been carried out at different times: 1, compression; 2, puncture; 3, opening and packing; 4, osteoplastic resection. Since, in a fair proportion of the cases observed, it was possible to reduce the size of the tumor by compression, varying methods of this were tried. There was temporary success in some cases, but frequent recurrences. The usual method was to pad the tumor well and then, by means of bandages of muslin or caoutchouc, to maintain continuous direct pressure. After some weeks of this treatment, in a few cases, it was found possible almost to obliterate the tumor but the distress was so great to the patient and the recurrences so frequent that other means of treatment were sought. Aspiration through a hollow needle was made and this was followed by compression. The results tallied nearly with those of compression alone, unless infection followed, as was to be expected in pre-antiseptic days.

During the period that puncture was popular, many of the observers noted that their needles, after passing through the tumor coverings, came in direct contact with denuded bone. Gaining thus the idea of a caries or necrosis existing, they proceeded at once to treat the imagined bone disease after the methods then employed. Laying open the sac, air would escape and the peculiar elevations described as resembling stalactites and stalagmites would be scraped away or chiseled off and the wound packed with charpie or lint. This was promptly followed by an abundant suppuration, violent infection

and sometimes death. As said before, we now recognize these bony irregularities as simple osteophytes and exostoses due to the displaced bone-forming elements of the periosteum. One author (Wehrner) demonstrated the possibility of cure in his case by the injection of tincture of iodin. Beginning at a point distal to the mastoid, he practiced an injection of a few minims of iodin and applied compression. This resulted in a partial obliteration of the walls at that point. Following this by a series of injections extending over a period of two months, he succeeded ultimately in causing aseptic adhesions between the tumor walls, having allowed, prior to the injection, the escape of air through his needle or back through the channels through which it came.

We understand now why the third method of treatment—that of boldly laying open the gaseous cavity—became so disastrous a procedure, for we know the dangers of a suppurative process which has extended to the mastoid cells. Since the era of antiseptic surgery, these dangers have been so nearly dispelled as to render the general opening of these cavities a safe procedure and, in nearly every instance, a perfect cure is effected if pains be taken to so dispose the incision as to make the point of final healing immediately opposite the bony perforation through which the air entered the tumor. In my case it was easily possible to find the openings in the mastoid process, to enlarge them, and, having removed the major portions of the osteophytes and bony ridges, to bring the walls of the gas-containing cavity in contact, and by simple compression to secure their adhesion to those surfaces from which they had been torn.

Some writers (Sonnenberg, etc.), after opening widely such cavities, have been unable to demonstrate the existence of any perceptible opening in the mastoid process—even though they allowed the patient to come out of his anesthesia and made either inflation of the Eustachian tube or had the patient repeat the process

by which he formerly had been able to drive air into the tumor. The failure of the patient's efforts to force air through these openings may be rationally explained. By the time he was sufficiently awakened to make the effort the openings were probably plugged with clotted blood.

For the convenience of future investigators of this subject and of those desiring to consult the original literature, I have appended a table giving a synopsis of the salient features of each reported case from which, by easy deductions, the percentage mortality, the prevailing treatments, the more frequent location and what associated special senses were disturbed can easily be ascertained. A list of the literature consulted is likewise appended.

Costes of Bordeaux, reporting the fifth recorded case and making an exhaustive study of the four preceding cases, prepared so excellent a memoir on this subject that in all details except treatment he has covered the ground completely and the conclusions which he arrived at in 1859 still hold absolutely true for the present time. They are as follows:

1. Pneumatoceles are very rare.

2. They always depend on perforations of the bony walls.

3. They are always tympanitic.

4. They are more or less reducible by pressure.

5. They can take their origin from the mastoid or frontal sinuses only.

6. They are of very slow and indolent formation.

7. They are never dangerous except from complications (infections).

In conclusion, I desire to acknowledge the very able assistance rendered me by Dr. J. C. Hollister in reviewing the literature of the subject and in collecting the data.

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DISCUSSION.

Dr. E. Wyllys Andrews, Chicago.—I imagine that there will not be very much discussion on this paper. I would not be able to discuss it myself, except that through the kindness of Dr. McArthur I operated upon this case of pneumatocele at the hospital in which he and I do more or less surgical work. I must confess that up to that time I had never seen a case.

The clinical picture of a case of this sort is not only very interesting, but it has a humorous side. Take a number of physicians and medical students, and show

them a case of pneumatocele, and you will see a surprised lot of men. You have a large bulging tumor which looks alarming, but presents tympanitic resonance on percussion, a combination puzzling to one. As you know a very small number of cases have been reported up to the present time.

THE VALUE OF SKIAGRAPHY IN THE TREATMENT OF FRACTURES.

H. A. SIFTON, M.D.,
MILWAUKEE, WIS.

The discovery of skiagraphy marks a new epoch in the treatment and diagnosis of fractures. Before this discovery the physician looked with dread upon every case of complicated fracture coming under his care and had to content himself with unsatisfactory results. Even to-day our results are none too satisfactory, but whatever advance has been made is due almost entirely to the skillful use of the Rőntgen ray. In this paper, which I have made as brief as possible, I will endeavor to show that skiagraphy may be the harbinger of evil as well as of good, and one who is going to use it should remember that "a little knowledge is a dangerous thing."

Skiagraphy has its deceptions, and satisfactory results can only be obtained from a good skiagraph, taken by an expert, under proper conditions.

The possible errors in taking and reading a skiagraph are many. In fact, it is possible to show almost any condition. A large amount of deformity and displacement can be represented where none at all exists. Overlapping and shortening can be shown where none is present. It is even possible to show a fracture where there is no fracture, and to fail to show a fracture where one is present. This distortion of the picture may be due to lack of skill in taking the negative, or it may be due to too great skill used for the deliberate purpose of producing false evidence.

I have here a few negatives which will make these deceptions clear. The first is a femur which was placed at the ordinary distance of about two inches from the plate. Next is the same femur in which the plate was simply set back six inches. The next negative shows a fracture where none existed. In the next no fracture is shown although the broken ends were separated at least an inch. In this negative the bones appear to override, where in fact no overriding was present.

The possibility of such errors as these bring before us very forcibly how wholly unreliable the radiograph is as a proof of the actual condition of a fracture, or even of the existence or non-existence of a fracture, unless we are fully conversant with the conditions under which the radiograph was taken. On the other hand, a radiograph taken under proper conditions and read by one who is familiar with their deceptions, affords us the most valuable evidence of the exact conditions. Especially is this true of a fracture of the extremities. In fractures of the skull and spine it is of but little value, owing to the density and complexity of the overlying tissues. Skiagraphy has taught us many things in regard to the relations of the parts in the complicated fractures that are found in the neighborhood of joints, especially about the ankle and wrist. And because of this knowledge we can treat such fractures in a far more intelligent manner than formerly.

It has come to be my custom to examine and adjust every fracture of any importance under anesthesia, and put it in a permanent dressing, either of plaster or some other material best suited to the particular case. Then a skiagraph is taken in two planes at right angles to each other. In the case of a femur the pictures are taken with the patient in bed with extension applied. A careful study of these skiagraphs, together with the knowledge I already have from my examination under anesthesia, puts me in possession of the most perfect knowledge obtainable of the actual relations of the

broken parts. And so I am at once able to decide in the case of the femur whether or not the proper amount of extension is being applied, and in all cases whether or not the parts are in as good a position as it is possible to obtain in the particular case.

Before the discovery of the Rőntgen ray it was impossible to recognize the exact amount of displacement in some fractures, and so skiagraphy has brought before us the question of how much displacement is allowable? Of course no pains should be spared to approximate the fragments in as perfect a position as possible, but even then we meet with cases in which, after every effort at replacement, the radiograph shows a certain amount of displacement, and so it must be at once decided whether it is better to let the displacement remain or to replace the parts through an open wound. I have come to the conclusion that no displacement is allowable in the neighborhood of a joint, and if any exist it should be corrected by operation, provided of course, that the patient can be placed under proper surroundings. On the other hand, in the shaft of a long bone a certain amount of displacement may have no influence on the fracture either as to its time of healing or as to the future usefulness of the part after repair is complete. No displacement other than lateral or anterior-posterior is allowable, and from a large number of observations I have determined that if the displacement is not greater than one-fifth of the diameter of the bone involved, and no fragments or other foreign structures intervene between the broken ends, the fracture will unite as promptly and as perfectly as if they were exactly end on.

In conclusion, I am of the opinion that, when it is possible, the Röntgen ray should be used in the treatment of every fracture. As we have seen, it has its deceptions, but these mean nothing to the physician who has made a study of the subject and is familiar with the conditions under which the skiagraph was

taken. Some say use it in the obscure or complicated cases only, but the difficulty with this plan is that we can never tell whether or not a fracture is complicated until a radiograph of it is taken. Any one who has had much experience with fractures in the neighborhood of the wrist and ankle will recall cases that seemed to be most simple, but resulted very unsatisfactorily to both physician and patient. These apparently simple cases are the very ones which a good radiograph will show to be complicated and at the same time enable us to replace the small displaced fragments which are too small to be felt through the swollen tissues but large enough to permanently disable the joint if allowed to remain displaced. It is our duty to do our best by our patients, and to do this we must look upon every case of fracture as complicated until it has been shown to be otherwise by a good radiograph.

Patients demand the most perfect results in a fracture, expecting the broken part to be just as perfect as before the injury. This is demanded irrespective of the kind of fracture or the circumstances under which it must be treated. The only way we can give these results is by the use of the Röntgen ray, and if we are unable to correct the deformity the radiograph will enable us to make an estimate of the outcome of the fracture. So by the use of skiagraphy the physician is not only doing his duty by his patient but at the same time he is also protecting himself from future trouble. There is no doubt but that a good radiograph is of value for future information from a forensic standpoint, but it is my opinion that no radiograph should be admitted as evidence in any medico-legal dispute unless both parties to the dispute know the conditions under which the radiograph was taken.

DISCUSSION.

DR. L. L. MCARTHUR, Chicago—I do not think a paper of such excellence as this ought to be allowed to go by without discussion. This subject is one of im-

mense importance to the surgeon from a forensic standpoint. In 1898 I read a paper with a similar title before the Alumni Association of Cook County Hospital, in which I urged the point that the surgeon should protect himself by making an *x*-ray picture of a fracture after the limb had been put in the best possible condition and submitting it to the patient, telling him that that was the best possible condition that he could obtain, and asking him if he were satisfied with it. In this way the surgeon would let the patient know that he had utilized *all* the means in his power to accomplish a good result. Furthermore, in this paper I urged the appreciation of the fact by the laity and profession that it was not essential for a good functional result to have actual anatomical reposition of the fractured ends, and that as a matter of fact, the vast majority of fractures which were treated then and had been treated before the era of the *x*-ray, did not have an actual anatomical reposition, but usually there was obtained a perfect functional result. It matters not whether, as the essayist has said, there be a slight lateral displacement in one way or another, if it be not too great. He has fixed for himself an arbitrary measurement of one-fifth of the diameter of the bone in question. That may be all right. In any event, we agree and endeavor to impress the point that a good functional result is not necessarily a good anatomical result.

Dr. J. W. Andrews, Mankato, Minn.—I have been exceedingly interested in this paper, and it is a revelation to me to know that skiagraphs so different can be obtained from the same case. I have had considerable experience in *x*-ray work in connection with fractures; but it has usually been my custom to take one or two skiagraphs of each case. I say, it is a revelation to me that so wide a difference may exist in skiagraphs of one case. It has been said that no great good can come from a useful thing without its attendant evil. And so it is with the *x*-ray. Since the introduction of it, and, again, since the introduction of insurance companies into our profession, that is, companies that are insuring physicians and surgeons against loss by malpractice suits, there have been more of these suits, and it is unfortunate that there are so many surgeons, so many physicians, who do not rightly understand the use of the *x*-ray; in other words, who do not recognize

that it is practically impossible to get absolute apposition of the fractured ends of bones, and that, as Dr. McArthur has said, it is unnecessary to have absolute apposition, and yet the layman, and some physicians especially, in cases of malpractice feel that there must be absolute apposition, and that union must take place in that position. Hence there is a growing tendency upon the part of the laity especially to have all fractures examined by some one with the *x*-ray after healing has taken place, and unless the result is a perfect one; then there are, at least, threats of malpractice and injury to the reputation of the surgeon.

Dr. C. E. Ruth, Keokuk, Iowa.—The medico-legal aspects of this subject are of considerable importance. I was glad to have heard the paper, because of the great number of malpractice suits that emanate as the result of fractures where the basis of the proceeding has been the findings or supposed findings from *x*-ray pictures. I think we should all use the *x*-ray in these cases more than we do. I dislike very much to treat a case of fracture through without having made fluoroscopic examinations in different positions. Sometimes we are disappointed as to the findings, and I think we should be very careful about not only giving ourselves all the protection we can, but also those of our brethren, who may be a little bit unfortunate as to what the patient may think is the result that should have been obtained in the treatment of a fracture. We should be very careful not to tell anybody that we will in any case get a perfect result. When I say that, I do not mean we will not in the majority of cases get a perfectly satisfactory functional result, but it is, as has been stated, impossible in some cases to get a perfect adjustment of the fragments. Though we will get good strong union, we should aim to get as nearly perfect apposition as possible and maintain the relations; but if we are sure we get a fairly close relation of the bony structures, with no soft parts intervening, we will get strong union. The people should be given to understand that we can not in any case obtain a perfect anatomical result, although we may get a good functional one.

Dr. A. I. Bouffleur, Chicago—I wish to compliment Dr. Sifton upon the general tenor of his paper, the fairness of it, in presenting both sides of the question. We all recognize the value of the *x*-rays, yet

there is a marked tendency in some quarters to rely upon it and to place implicit confidence in it as a means of diagnosis. I believe that is an error. As a confirmatory measure, it is undoubtedly of great value; but as a substitute for ordinary means, it is in my opinion not proper to place the reliance on it which we hear concerning it at times.

There are several features to this question which become serious when we get to thinking them over. In the first place, if we say that it is an absolute necessity to examine all cases of fracture with the *x*-ray in order to treat them intelligently, then we must at once shoulder the responsibility of having the *x*-ray with us in the examination of every fracture. That is, of course, impossible. If we come to the position that it is necessary to be possessed of a certain instrument or apparatus in order to treat a case intelligently, but for certain reasons or circumstances in which we are placed it is impossible to have it, it means that we are not competent or are not equipped to treat the case, and therefore from a legal standpoint should turn it over to some one who is equipped to do so. That may be impossible. We cannot carry this apparatus in our gripsack, and even those who have elaborate *x*-ray apparatus are rarely able to interpret the findings correctly, particularly the fluoroscope findings, so as to be able to rely on them. As a confirmatory measure, then, I should say the *x*-ray is very valuable, but as a single diagnostic measure I think its value has been greatly overestimated. It is leading us too much to discard ordinary principles in mechanics in the diagnosis of fractures. He who is going to treat fractures must be more or less of a mechanic, and if he gets away from the mechanics of fractures, being led by a desire not to hurt the patient, say by the fluoroscope picture or by skiagraphs, he will get into trouble sooner or later. I would put it this way: We should try to make a diagnosis looking particularly to the mechanics of the part, the bones, etc., from the mechanical framework of the body, and when we get the thing down to a mechanical solution we have something definite to work on. As a confirmatory measure in medico-legal cases, I prefer to have some one other than myself make the skiagraph.

DR. M. L. HARRIS, Chicago—This association ought

not to go on record as giving support to the statement that all fractures should be treated under the *x*-ray, on account of the objections made by Dr. Bouffleur and the impossibility of having the *x*-ray at hand. On the other hand, the *x*-ray is unnecessary as a means of diagnosis in nine cases out of ten, or in nineteen out of twenty. It is not only unnecessary, but it does not furnish us with any information which cannot be obtained in other ways. Any one who is familiar with the effects of force, when applied to bones—in other words, the mechanism of fractures, will be able to tell exactly what has taken place in a fracture in nineteen cases out of twenty, and he will be able by examination and with a knowledge of this force to tell the actual conditions present without the aid of the *x*-ray. I admit that occasionally the *x*-ray is of value in showing us something which we could not detect in any other way.

The fallacies of the *x*-ray, as has been shown here, are very numerous, and it is impossible in many cases for anyone to interpret correctly an *x*-ray picture. I have made many errors myself in interpreting *x*-ray pictures. I have seen many errors made by my colleagues, and I think, while appreciating as much as anyone can the benefit of the *x*-ray to the profession in general, we should not go to the extreme of giving it too much importance until something more is known about it, for the reason that we are not always able to interpret correctly *x*-ray pictures. For several years I have taken the position that an *x*-ray picture should not be permitted in a medico-legal case in court, and I have had occasion to argue on this side of the question and to prevent the introduction of *x*-ray pictures in court. In fractures it is particularly improper to admit them as evidence. An *x*-ray picture is usually taken by the side prosecuting, and it is taken in a manner to show to the greatest disadvantage of the case. It is taken in a manner which is not explained to the court; and the opposite side is not permitted to take a picture with a view to showing perhaps a fallacy or incorrect interpretation of the skiagraph introduced. If a physician himself is unable to interpret correctly the *x*-ray, how much less is an ignorant jury able to interpret it? It has no place in court, and should never go before a jury for them to judge of it. For these reasons, then, that

we are unable to interpret skiagraphs correctly in some cases, and that it is unnecessary in nineteen cases out of twenty, we should not go on record in support of the statement that every fracture should be treated by the aid of the *x*-ray.

DR. A. E. BENJAMIN, Minneapolis, Minn.—I wish to say a few words in defense of the position I took yesterday in my paper. In it I advocated the use of the *x*-ray in every case of fracture. I modified that statement in my article farther on. I think it is impossible to tell absolutely what has occurred in a fracture of the elbow joint without the aid of the *x*-ray. Nor is it probable with the *x*-ray, except by one who is familiar with or is capable of interpreting the skiagraphs to determine with accuracy the condition. We should have associated with us in these cases some one who is familiar with *x*-ray work, and with a large experience. While we are able to determine in the majority of cases without the use of the *x*-ray just what has occurred, yet we know in some cases there are splinters of bone which we may not be able to discover, and non-union takes place so frequently that it is well to employ this additional confirmatory test in the treatment of these cases.

I am very glad to have seen the skiagraphs Dr. Sifton has shown, as they bring out the medico-legal aspects of the subject very clearly. I barely mentioned that in my paper, but hoped that it would be brought up in the discussion. The position I took I am aware was somewhat radical, yet I feel that the treatment of fractures, especially of the joints, has not advanced as rapidly as other fields of surgery.

DR. SIFTON (closing the discussion)—I wish to thank the gentlemen for their free discussion of my paper and of this subject, but I think the subject is one that needs considerable discussion.

There was one point I wished to bring out in the paper forcibly, and that was referred to by Dr. Harris, namely, that these skiagraphs should not be used as medico-legal evidence because, as has been pointed out, in some of these skiagraphs almost any condition can be shown that we desire. If we wish to produce false evidence, and that is what some do (and Dr. Harris knows it as well as I), skiagraphs should never be admitted as medico-legal testimony under any circumstances.

Again, the position that the laity take in regard to fractures is a reflection, and if it is once understood that these *x*-ray pictures are nothing but shadows, and are not always correct, and physicians taught the laity that there is always a certain amount of overriding of fragments, which is of no functional importance, great good will be accomplished. I think Dr. Harris, howver, goes too far. He has probably gone to the other extreme in saying that nineteen cases out of twenty of fractures can be made out without the *x*-ray. There is no question but that it is unnecessary in a considerable number of cases. Where it can be used, however, and where we have an expert who can use it, it is certainly of great value.

THE MANUFACTURE AND USE OF TIN SPLINTS.

WITH SOME SPECIAL APPLIANCES.

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MINNEAPOLIS.

I have chosen this subject not because tin splints are not used but because the general practitioner does not realize how easily he can make them himself to fit each individual case, and because I have some special devices to offer which I have found of considerable value.

Sheet tin is a material peculiarly adapted to form some of the common splints we are called on to use. It is thin and light, when shaped into a splint it has considerable firmness, and it is a material which is easily manipulated. The equipment is simple—a small vise, tin shears, a hammer, a 5-cent punch and a few small rivets. I have made all the splints which are illustrated in this article out of about 30 cents' worth of tin. I have a metalworker's hammer; it is a convenience, but most of my work has been done with a common, cheap, carpenter's hammer. A small block of soft metal or a piece of hard wood is a convenience.

In the manufacture of splints it is no small consideration that we can make a splint to fit the individual case. A pattern is easily made by laying a sheet of paper on the place to be fitted and then marking a rough outline of the splint to be made, e. g., on the dorsum of the thumb for the dorsal thumb splint (Chart

1, Fig. 2). The paper is now removed and the rough outline is again gone over with the pencil to smooth out its irregularities. This is cut out and serves as a pattern (Fig. 1). This pattern is laid on the tin sheet and outlined with a pencil or scratched with a metal point, such as a nail or scissors. The splint is then cut out and shaped to fit the part. In order to give it a finished appearance and to cover any ragged edge it may have, a narrow strip of surgeon's plaster is rounded over the edge about the splint.

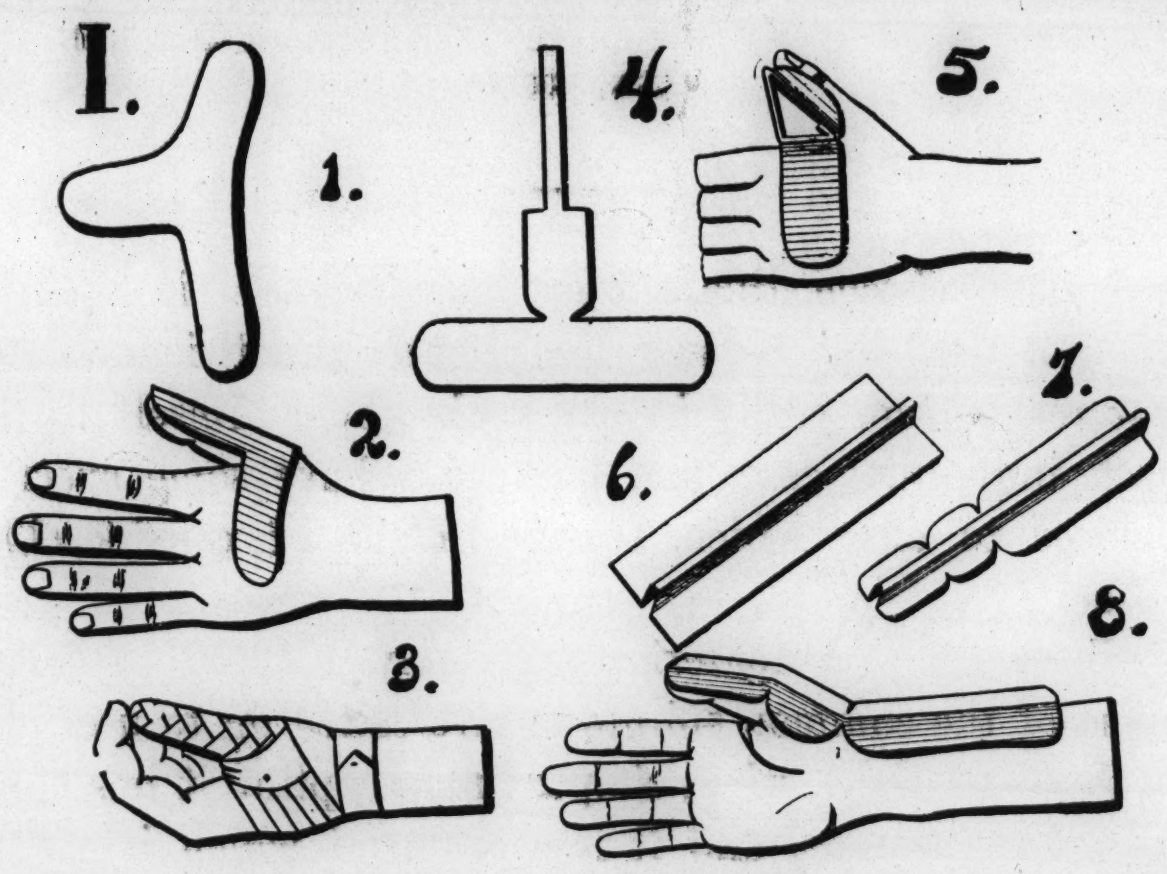


Chart 1.—Thumb splints. 1, 2 and 3, Dorsal splint; 1, Pattern; 2, outline for pattern; 3, splint applied. 4 and 5, Goldthwait splint; 4, Pattern; 5, splint; 6, 7 and 8, long dorsal splint; 6, Shows the ridge for strength; 7, outline cut; 8, bent and shaped.

This dorsal splint makes a firm splint for the thumb when properly fastened, and it lends itself gracefully to bandaging (Fig. 3). In Figures 4 and 5 we have the splint devised by Goldthwait of Boston. The pattern, Figure 4, may be made by marking the lower wings the width and length for the bearing on the hand, the middle portion the length and width desired for the thumb, and the upper portion about one-quarter of an inch wide and long enough to bend downward and then backward to or beyond the angle at the base of the thumb and

thus to act as a brace for the thumb piece, Figure 5. A strip of surgeon's plaster placed downward over this strip and then turned under the hand-piece serves to hold it firmly in place. The middle portion is trimmed and shaped to fit the thumb and the splint is finished, as all the splints are, by a narrow strip of surgeon's plaster about the edges.

These two patterns form serviceable splints for the thumb and they are simple and easy to make. There are several other patterns which suggest themselves, but

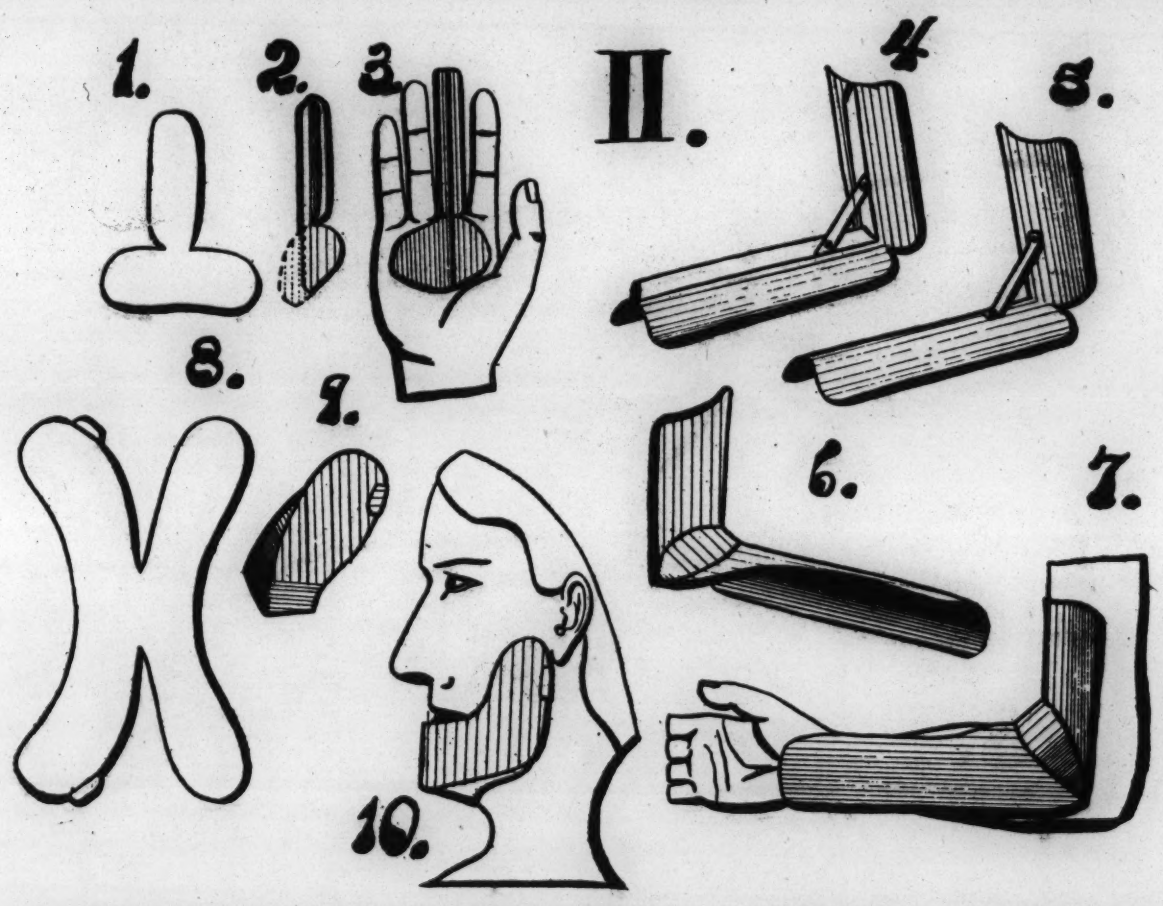


Chart 2.—1, 2 and 3, Finger splint: 1, Pattern; 2, splint; 3, splint applied. 4, 5, 6 and 7, Internal angular elbow splint; 4, With the ridge; 5, without the ridge; 6 and 7, with forearm piece swung to the inside for "thumb-up" position. 8, 9 and 10, Jaw splint: 8, Pattern; 9, splint bent—shows half of splint; 10, splint applied.

these will suffice and we will pass on to the long dorsal thumb splint (Figs. 6, 7 and 8). This splint gets its strength from the ridge, which is made by folding the strip of tin along its middle line, first by hand and then by pounding it with the hammer along the bend, using repeated blows of medium force until it is quite flat and straight. This fold is placed about a quarter of an inch deep between the jaws of the vise and the free edges are bent outward in successive portions from

one end of the splint to the other. To make it flat and smooth along the center it is hammered while still in place but with the vise just loose enough to allow it to be drawn slowly through from one end to the other. It is evident that the strip of tin from which the splint is to be made should be cut half an inch wider than the splint is intended to be in order to allow for the double fold in the ridge, and it should be as long as the desired splint.

The splint is to be bent to conform to a natural position of the thumb and of the wrist. At the points cor-

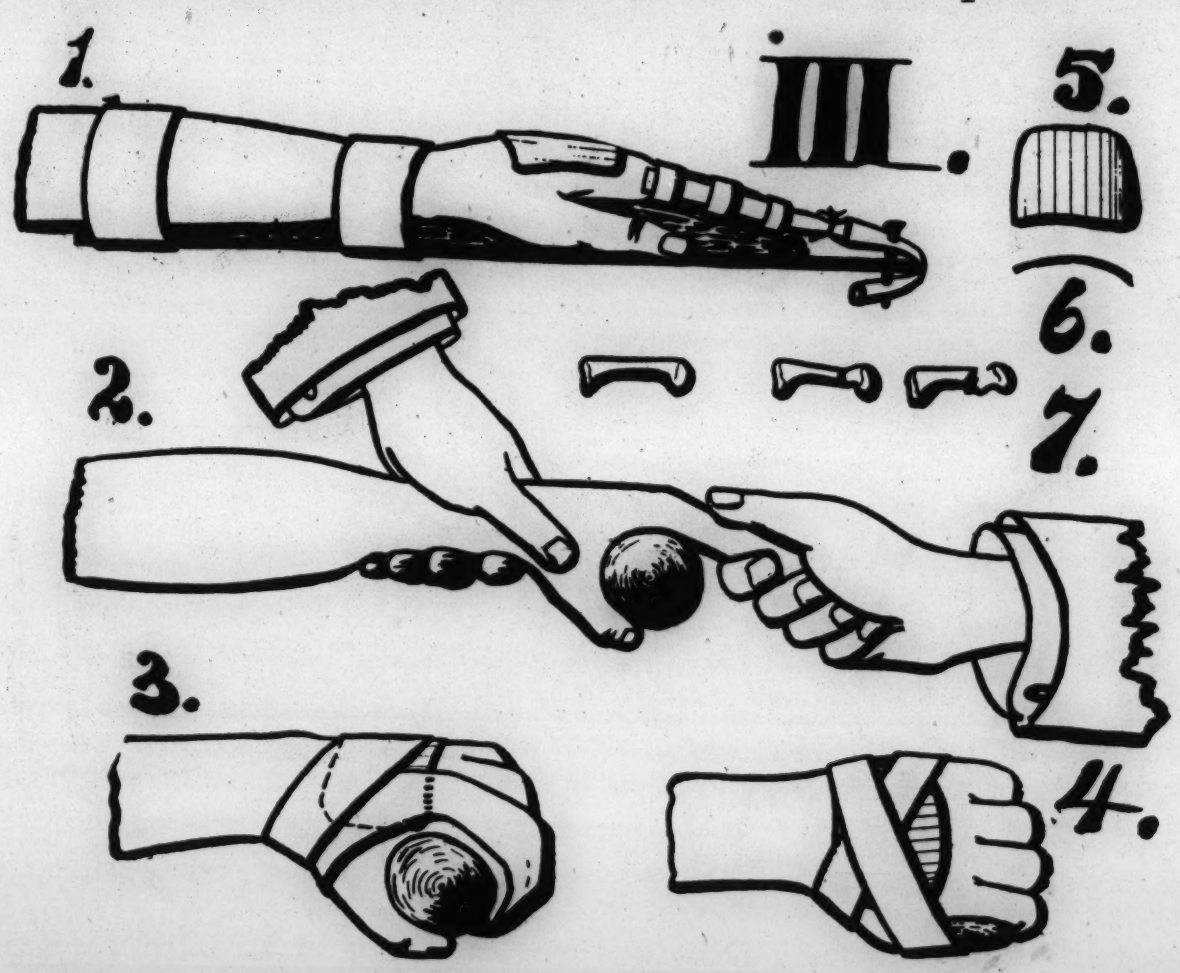


Chart 3.—Dorsal tin splint for metacarpal fractures. 7. Tendency of bone to cave downward.

responding to the base of the thumb and to the bend at the wrist, the tin should be cut straight in to within a quarter of an inch of the ridge, to allow the shaping of the splint after it is bent. The three segments of the splint should be trimmed to fit the parts they are to lie against. The ridge is now grasped in the vise and the splint bent backward at the wrist angle. The wrinkle made in the ridge is pounded smooth. This rivets it to itself and makes it firmly support the bend in the splint. The angle for the thumb is bent in the oppo-

site direction. This time the ridge is stretched but it is very firm. The tin is now rounded to fit the parts and the ridge is beveled at the ends of the splint by cutting, or is smoothed over by being hammered flat.

This long dorsal thumb splint is of service in those cases in which, in addition to fixation of the thumb, we wish to fix the wrist also, as in some cases of dislocation

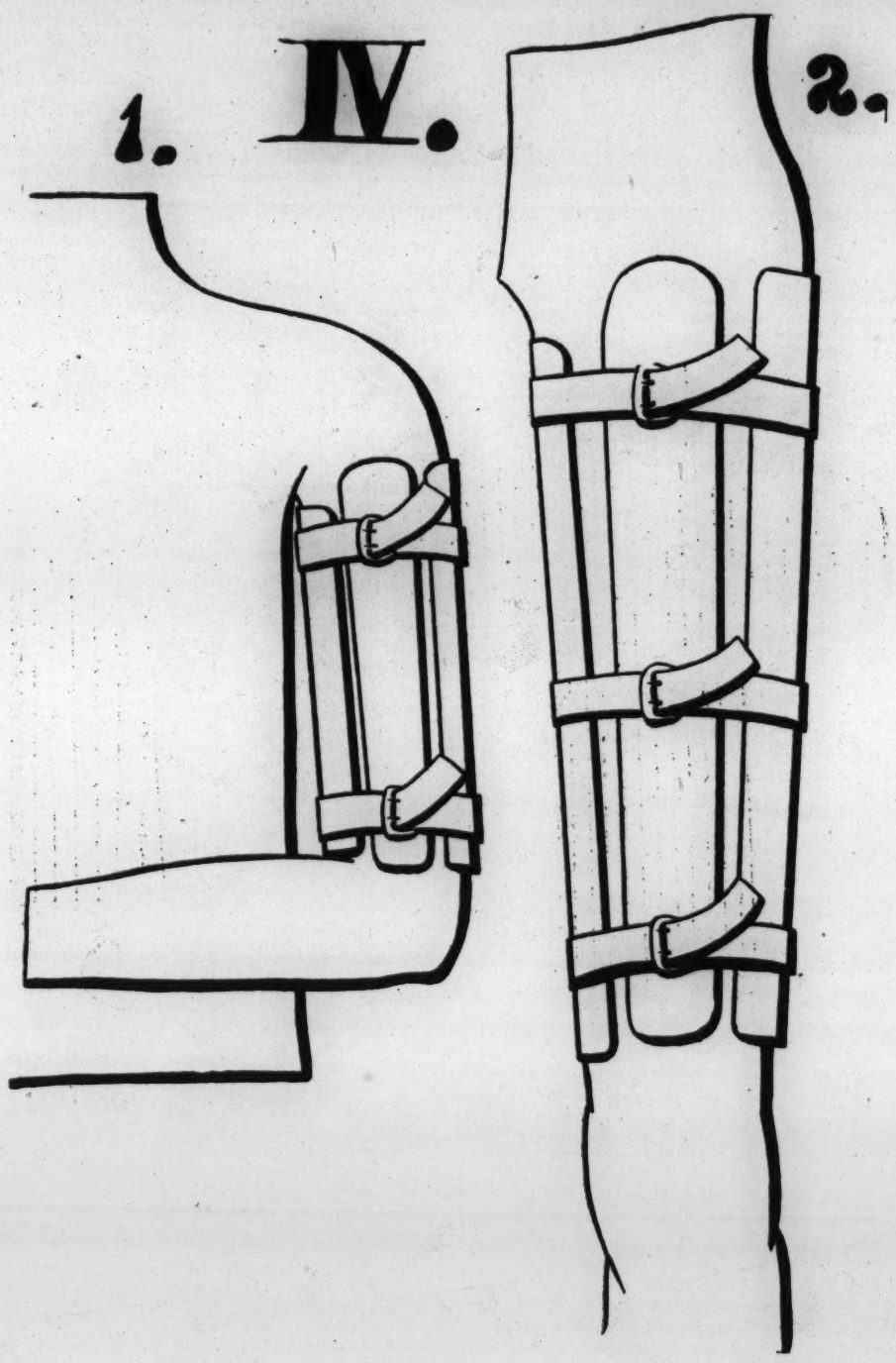


Chart 4.—Coaptation splints for thigh and forearm.

of the thumb, some sprains of the thumb, tenosynovitis of the thumb tendons, some fractures of the metacarpal bone of the thumb and in suture of the thumb tendons.

Finger splints need little description (Chart 2, Figs. 1, 2 and 3). The patterns are simple; they are easily made; they have a narrow ridge to strengthen them, and this may be left standing or may be hammered over flat.

Fracture of the radius, of the ulna, or of both bones of the forearm above the middle, and some other conditions are best treated with fixation of the elbow at a right angle, in addition to other appliances. While plaster-of-paris fixation is suitable in some cases, many cases are more conveniently treated with the internal angular tin splint (Chart 2, Figs. 4, 5, 6 and 7). This is light in weight; it is easily removed and reapplied; it offers a certain amount of freedom of inspection even when not removed; and when once made it is always ready for use. The chart shows tin splints

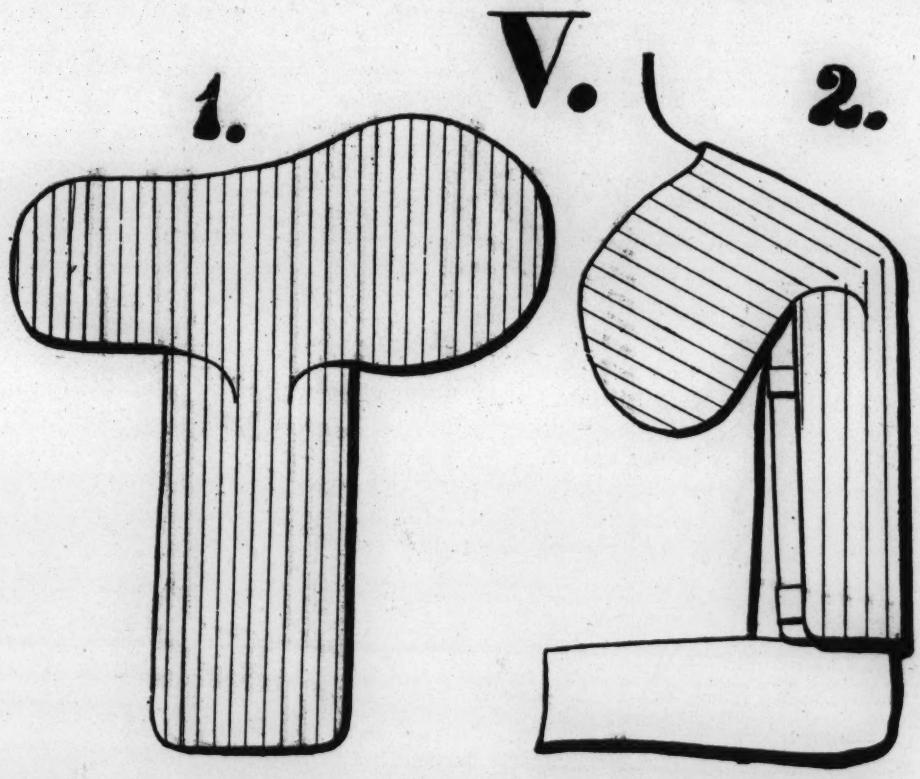


Chart 5.—Shoulder cap: 1, Pattern; 2, splint.

which can be easily made. Figure 4 shows one with the ridge bent in it. A small folded piece of tin riveted across the angle adds materially to its strength. Figure 5 shows one nearly as strong, bent from a single piece of tin without the ridge. These are both cut in at the elbow to allow bending at right angles.

A splint which is of greatest convenience is the one shown in Figures 6 and 7. This is cut so that the piece for the forearm swings over to the inside and makes it easy to place the arm in position with the thumb up, a position which is the most satisfactory one for most cases, as it is a position in which the ulna and

radius are far apart, a thing of prime consideration in the treatment of fractures of these bones and it is the most natural and comfortable position for the arm to be in. The splint is constructed of three pieces, one for the upper arm, one for the lower arm and a small elliptical piece to strengthen it at the elbow. The upper piece should be cut out from its pattern first. It is bent to fit the curve of the arm and is then placed in position, with its lower edge against the paper which is being used to mark out the pattern for the forearm piece. This will allow an accurate outline at the elbow.

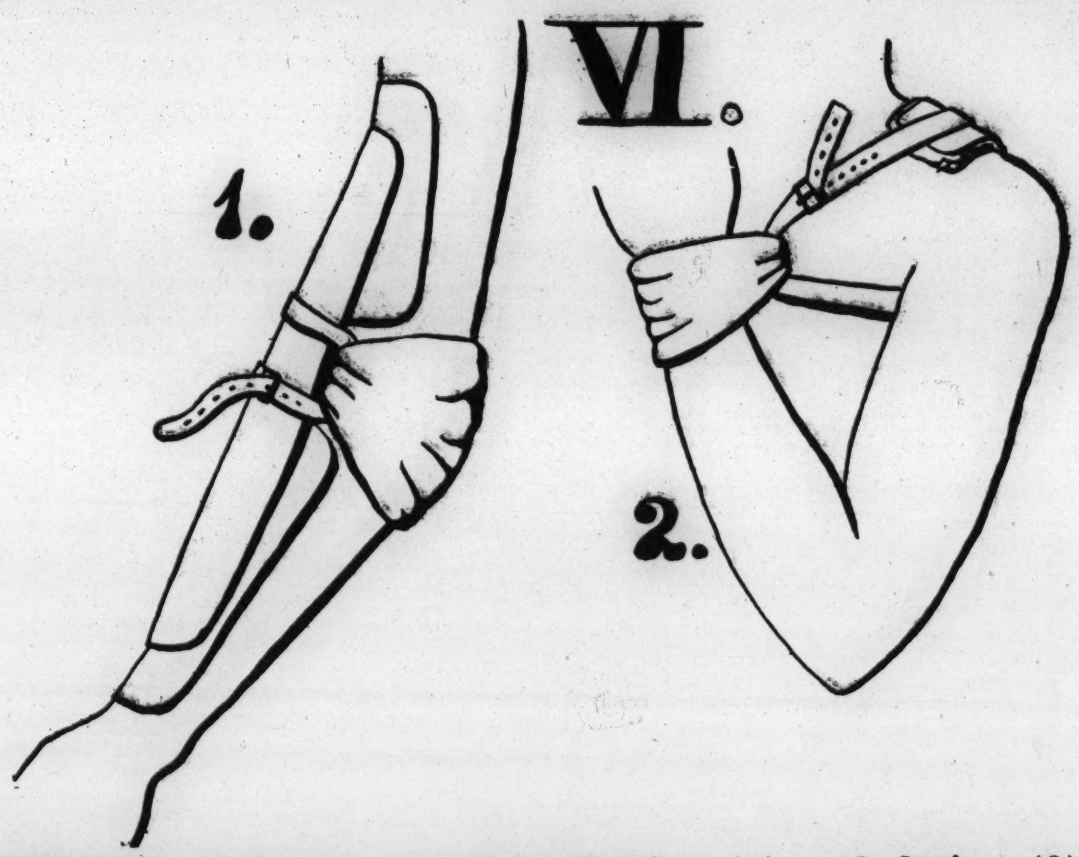


Chart 6.—Apparatus to gain extension (1) and flexion (2) at the elbow joint.

The remainder of the pattern is outlined as in the figure. The splint may be fastened together in various ways. A simple method would be to fasten it at the elbow line with narrow strips of tin riveted into place, and to substitute for the elliptical brace one or two small folded strips of tin, as in the other splints described.

Fractures of the lower jaw, as a rule, are best treated in some other way than by the use of a splint, but if an external splint is used, a tin splint is light, strong and easily made (Chart 2, Figs. 8, 9 and 10). A pat-

tern is easily cut out, as follows: Apply the upper part of a sheet of paper over the mouth and jaw, back as far as the ears, and mark the outline corresponding to the lower jaw. Now hold the paper at the point of the chin and tip the lower portion up under the jaw, and fold the sides up to the ears and mark the outline of the jaw on each side, and the curve of the throat between. This gives a pattern such as shown in Figure 8. The wings are bent with the fingers and the lower portion bent up at the proper angle for the chin. If a small piece of tin is left on the upper wings, as shown in the pattern, these can be bent over and will act as hooks to catch the lower wings when bent up and will lock them into place instead of a rivet which might be used.

Fractures of the metacarpal bones are often unsatisfactory to treat. The usual tendency is for the bones to cave down (Chart 3, Fig. 7). Most of the devices for the treatment of these fractures aim at traction to overcome shortening, and then at some form of rounded pressure in the palm to force up the arch of the bone.

To these methods I have added a dorsal tin splint, curved to fit the back of the hand but straight in the line of the metacarpals (Figs. 1, 3, 4, 5 and 6). This offers a firm surface against which to force the fractured metacarpal by the palmar padding.

Fracture of the shaft of the femur and of the shaft of the humerus are best treated, as a rule, by coaptation splints for their inner set of dressings. Plaster of paris is not satisfactory; it is rigid and can not be tightened to keep pace with the atrophy of the soft parts. By the use of buckles and straps of webbing, coaptation splints can be tightened, daily if necessary, without disturbing the fracture (Chart 4). Tin lends itself very readily to the formation of coaptation splints. It is easily rounded to fit the curve of the thigh or arm, and when so rounded it is in the form of an arch and

is exceedingly strong. It is light and it is so thin that it offers the least possible interference with any outside apparatus which may be used. Large hospitals could have a number of these splints made, of various lengths, padded, covered with muslin, and stored away ready for use.

With fractures of the humerus high in the shaft, the control of the upper fragment is often unsatisfactory. A properly-fitting shoulder cap might help to do this, but I have never been able to find a properly-fitting shoulder cap on the market. The most

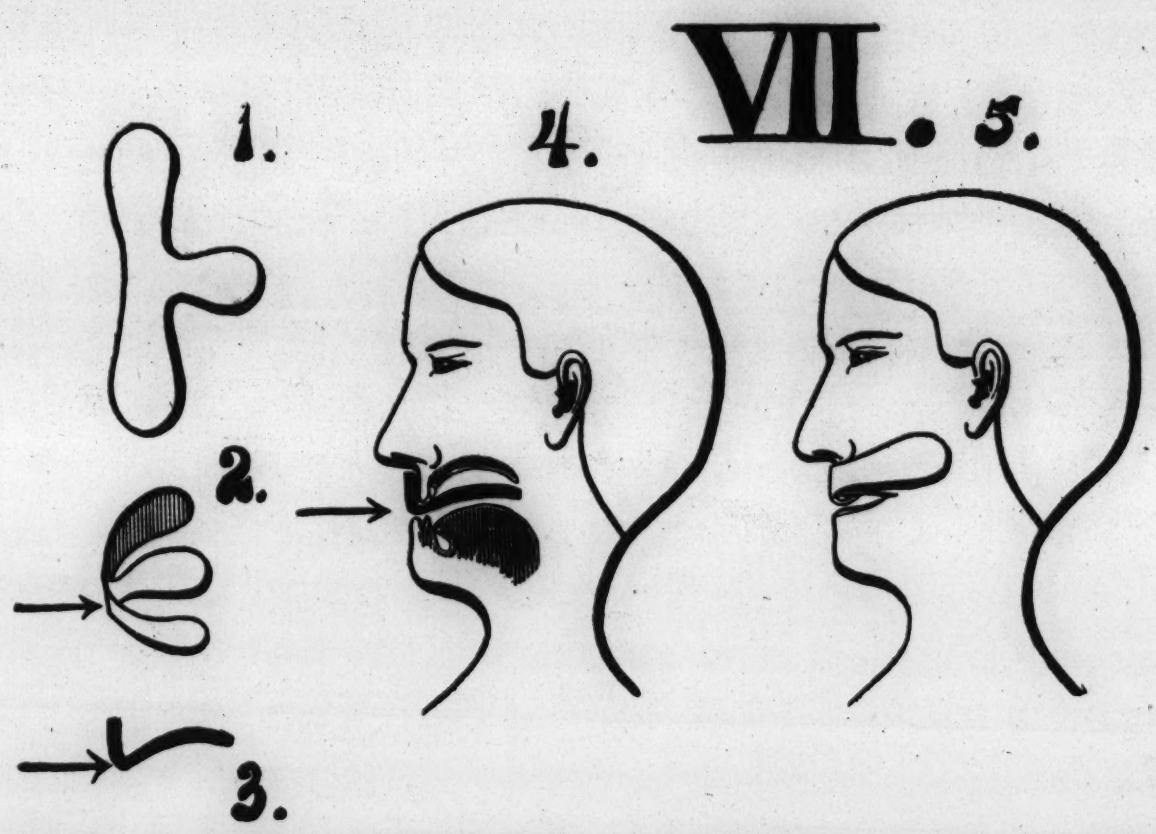


Chart 7.—Device for protection of the line of suture in cleft palate operations: 1, Pattern; 2, splint; 3, section; 4 and 5, splint applied.

that they do is in effect to lengthen the outside coaptation splints. They do not get a grasp on the shoulder and fix the shoulder girdle. One can be made of tin, however, which will do this (Chart 5, Figs. 1 and 2). By laying a sheet of paper over the shoulder, we can mark out a pattern well down on the chest in front and in the back, and then, holding it at the point of the shoulder, we can tip the lower end against the arm and mark out a sufficient arm-piece well down toward the elbow. This serves as a pattern. The splint may be made from one piece of tin or from two. The tin

is bent to fit the arm and shoulder, hammered a little at the shoulder to round it, and fastened with two or three small rivets on a side along the line of junction while held at the angle which best fits the shoulder. This splint, when properly fastened by adhesive plaster strips and bandage, gives firm support to the shoulder girdle and fixes the arm.

This brings me to the second portion of my paper, in which I hope to present briefly two original devices. The first one was worked out while trying to gain full flexion and extension at the elbow after a "T" fracture into the joint. It was successful beyond my expectations, and consists of two sets of appliances, one to gain flexion and the other to gain extension. The apparatus to gain extension (Chart 6, Fig. 1) consists of a tin brace extending from the upper to the lower arm, two tin shields to take the direct pressure of the ends of the brace off from the soft parts, a hammock of strong cloth doubled beneath the elbow and sewed in such a manner that a strap can be run through the end on one side, brought up over the brace and passed through the end on the other side and back above the brace again until it passes through the buckle. When the strap is drawn tight, the elbow is drawn directly up toward the brace, which is rounded in the form of an arch and is very strong. This allows the elbow to be strapped up toward the brace with all the force the patient can stand without too much pain, and it allows the restless patient to walk about, while the strap still does its work. When the arm yields a little, the strap can be tightened again. When the arm is nearly straight, it is best to prop the brace up a little distance above the arm by putting a pad under each end. This gives more room between the brace and the bend of the elbow, and allows the arm to come up more easily.

The device to gain flexion is even more simple (Fig. 2). A small tin shield, well padded, takes the direct pressure of a strap which passes over the shoulder and

beneath the axilla and then about the wrist, or through a broad band of strong cloth at the wrist and then through the buckle. The shield may be placed behind the upper arm and the strap run around the arm instead of around the shoulder, if desired, when some degree of flexion is gained. The advantage of this device, as well as of that for gaining extension, lies in the fact that as strong a pull as the patient can well stand can be applied, and it can be exerted as long a time as desired.

I have found that it is of greater comfort to the patient to use forced flexion one day and forced extension the next rather than to attempt both on the same day. This method of applying force, of course, can be used on elbows in which motion is limited from other causes, as after dislocations.

The last device is represented in Chart 7, Nos. 1, 2, 3, 4 and 5. It is made for the purpose of protecting the line of suture after operations for the closure of a cleft palate. The pattern is easily made. The center strip, which is to protect the suture line, is readily cut out, not quite so wide as the arch of the teeth, and not quite so long as from the lip to the back of the soft palate. The upper portion of the paper is turned up against the lip and cheeks, and the wings used as a support, for the splint may be marked out. The middle piece is bent to a flat arch, much flatter than the vault of the palate, and it gets its bearing either along the palate near the line of the teeth, or on gauze packing placed in the incision usually made near this line.

In actual use it best can be kept clean by wrapping the entire splint in rubber tissue.

DISCUSSION.

DR. JAMES E. MOORE, Minneapolis, Minn.—A number of years ago I did a good deal of orthopedic work, and I got to be rather expert in the use of plaster-of-Paris, so that I could treat almost any variety of fracture with it satisfactorily. But I realized also that it had its limitations.

The splints, such as Dr. Mann has exhibited, have various advantages. Dr. Mann is ambidextrous, and a mechanical genius. He can make these splints to fit almost any case, but I am not sure whether I could do it or not. I have had no occasion to treat these cases in recent years, because he has been at hand to do it for me. It seems to me, however, that any man who has mechanical ingenuity enough to treat a fracture, ought to be able to treat it in this way, and treat it well. I know it can be done, because Dr. Mann has done it for me as well as for others in many instances. He has helped me and others out in constructing these appliances for certain cases. Patients have derived great benefit from the use of these splints, and they claim they are light and comfortable.

Dr. John P. Lord, Omaha, Neb.—I have been deeply impressed with the value of this paper, for the reason that I have always been opposed to already manufactured tin splints, and consequently I have eschewed their use. I have tried to construct suitable splints out of the material at hand in a given case. It seems to me Dr. Mann has struck a happy thought here in so systematizing this matter that it will be very easy, by following his method of patterns, to construct very readily these splints for use, in order to meet the indications in given cases; whereas formerly, as I have done, we simply depended on material which could be found for these purposes. I regard the doctor's paper as a valuable contribution to this subject. I was particularly impressed with the simplicity of the method, and its ready means of adaptability.

Dr. Mann (closing the discussion)—I wish to thank the gentlemen for their remarks. I had hoped there would be more discussion on the production of motion in a joint that is limited, such as occurs in the elbow joint after some injuries. The point of being able to make a splint to fit the individual patient is certainly a very important one. It is said, for instance, that Mr. So-and-So down town has the finest pair of shoes in the city. and that we had better buy them. They may be the finest shoes in the city but they may not fit the purchaser. In regard to the coaptation splints, they can be made up in large hospitals, of different lengths, padded, covered with muslin, and stored away ready for use.

SYNCYTIOMA MALIGNUM.

H. C. CROWELL, M.D.
Professor of Gynecology in the University Medical College.
KANSAS CITY, MO.

When the case I am about to report, presented to me, I felt I had fallen upon a rare bird, and, indeed, so it seems, so far as our immediate locality is concerned.

Inquiry from various members of the local profession, who see things, disclosed no information or familiarity with this type of malady, the pathologists alone having knowledge and possessing slides obtained from other parts. Since reporting this case, however, as so often happens, one or two others have been discovered and recalled, and a perusal of the literature, especially of the last year, is so voluminous on the subject that much of the enthusiasm with which I started out in this report has oozed out, as I fear I can not more than add one more to the constantly increasing number.

CASE.—Mrs. C., aged 27 years, was brought to me by Dr. Everett Allen, Hickory, Mo., who gives the following report: Two children, the oldest 10 years, the youngest born April 27, 1904. With the first child had no trouble. Prior to the birth of the last child, was apparently in good health, weighing 138 pounds. The last labor was precipitate, with an adherent placenta, which necessitated removal by peeling it loose. Patient continued to flow, after delivery, for four months, some days profusely. On September 5 the uterus was curetted and a piece of necrotic tissue, thought to be placental, was removed. The débris removed was unattended by odor. At this time there was no elevation

of temperature, no chills or sweating, no nausea or vomiting, at the time of curetting on September 5. About the first of October, nausea and vomiting began, also, a slight rise of temperature, with rapid emaciation and a very rapid pulse. Very little discharge after the curettement, till on October 10 when she had a severe hemorrhage. On Septemer 5 the vagina was said to be free from any growth. On October 10 a large, fungoid mass filled the vagina.

The surface of this growth presented like thickened fingers, spread out; the cervix uteri at this time presented usual, conical surface above the vaginal mass, and the uterus was but slightly enlarged. After this hemorrhage had a very offensive putrefactive odor.

On October 13 water used as a douche returned clear, October 16 a piece of the mass removed from the vagina, looked like decaying placental tissue, being mottled, containing blood and spongy tissue. Temperature at this time, 101° F., pulse 160 to 170. On October 18, patient was brought to me and placed in the hospital. Was very much emaciated, pulse 165 and temperature 99. Digital examination revealed a fungoid mass springing from an excavation on the left side of the vagina. Uterus somewhat enlarged, cervix not necrotic but smooth.

Diagnosis suggested to me, from symptoms and history, was that of "syncytioma malignum." This diagnosis was prompted by, first, the early age of the patient and more, the history of continued hemorrhage, after the removal of an adherent placenta, attended by great and rapid emaciation, with the appearance of a metastatic growth in the vagina, its peculiar finger-like growth, together with necrotic degeneration, all of which history had occurred in the short space of five months, too short a time for any lesion less malignant, of which we have any knowledge.

On October 19, without an anesthetic, I scraped out

the mass in the vagina, from an excavation 1½ inches in diameter. The cervix admitted a curette without dilatation.

The uterine cavity was covered, for the most part, with a degenerated, pulpy, mottled material, but on the left anterior surface the scraping seemed to remove deeper tissue in the uterine wall. These scrapings, from both the uterus and vagina, were given to Professor Hertzler, pathologist of the University Medical College, who reports the microscopical findings to be identical and confirmatory of my provisional diagnosis "syncytioma malignum."

Report of Dr. Hertzler: "I beg to submit the following report on tissue removed from uterus and vagina of Mrs. C., from Hickory, Mo. The tissue was examined as presented, in three lots; the curettage from the uterus, the mass removed from the vagina and the section from the vaginal wall, near the ulcerated mass. The macroscopic appearance of the tissue removed from the vagina was of a mottled red and gray, with a marked predominance of the red. Intermixed with these, were darker masses of recently coagulated blood. The gray particles were indistinctly granular, while the red ones were distinctly fine granular. The tissue was made up of masses varying in size from a wheat grain to that of a large hazelnut.

"The material from the vaginal mass was darker in color and was necrotic, in many portions, which obscured the mottled appearance of the uterine mass. The section from the vaginal wall was injected, but on the whole was homogeneous in color."

Microscopic Examination.—Sections were made by Dr. Evans after imbedding in paraffin. They were stained by various methods; the most satisfactory for study were those stained with hematoxylin and eosin. The section is made up for the most part of a cloudy granular mass, through which are strands, staining faintly with hematoxylin (fibrin). Within this tis-

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sue are groups of varying-sized cells with sharply staining nuclei, with a fairly sharply defined border. These cells are round for the most part, but frequently are elongated or are irregular from compression (Langhan's cells). Distributed about in these cell-groups are large protoplasmic masses, syncytial, containing within them fairly well defined nuclei, usually spheroidal in outline. The nuclei within a particular protoplasmic mass show varying tinctorial properties.

Within these protoplasmic masses, are vacuoles, of varying size and number. These syncytial masses show degenerative processes more distinctly than the Langhan's cells. Scattered about are large cells, with sharply defined but pale nuclei, with a clear pale protoplasm. These have the appearance of decidual cells. The sections made from the material from the vagina have a similar structure. The degenerative and regressive processes are more marked. Sections made from the vaginal wall show sparse, small syncytial masses, with a moderate round-cell infiltration. Diagnosis, syncytioma maligna.

Subsequent History.—After returning home patient grew gradually worse and died November 4; no autopsy was permitted. The growth in the vagina continued to grow and break down, until at her death it was twice the size above reported. Another growth appeared in the right side of the vagina, which grew to the size of the one first reported. The hemorrhage was continuous, requiring constant packing of the vagina. There was also hemorrhage from hypertrophied tissue about the teeth. The pulse continued above 140, the temperature 99 to 100.6. She was unable to retain anything on her stomach for five days prior to death. Three days before death, became unconscious and remained so to the end. Family history absolutely good.

This rare disease, "syncytioma malignum," is classed with adenoma uteri, sarcoma, carcinoma, and some exceptional forms, by Reed and others, and readily con-

ceded the most virulent of them all. Syncytioma malignum has been described under the title of deciduoma malignum, malignant placentoma, carcinoma cellulare, deciduo sarcoma and chorioepithelioma, and is recognized as of the sarcomatous type, originating in the decidual structures of the pregnant woman and tending to a rapidly fatal issue. Sanger first spoke of this disease in 1888, and in 1893 brought out more fully the histology and pronounced malignant tendency. Whitridge Williams published an exhaustive article on the subject in the *American Journal of Obstetrics,* June, 1895. All investigators seem agreed that the disease originates in the chorioepithelium of the placenta and is therefore of fetal origin, which stamps it as a class by itself, when compared with other malignant neoplasms. The débris resembles very much disintegrating placental tissue.

The mass, which in this case was removed on September 5, was probably the pathologic growth and not placental remains, as was thought at the time. The cause of this disease is obscure. Marchand reported 15 cases, with a previous history of "mole" pregnancy in 12. MacNaughton Jones states that hydatidiform mole has been observed in 45 per cent. of the cases. Most reports to which I have had access describe some abnormality in the placental site, but nothing clearly pathognomonic has as yet been adduced.

The prominent symptom seems to be severe, intermittent hemorrhage, following labor or abortion. After the hemorrhage practically ceases, there ensues a foul smelling watery discharge; pain does not seem to be a prominent symptom. The emaciation is rapid and is said to be attended by cachexia, but in our case it was not marked. In this case the blood examination gave 22 per cent. hemoglobin. The diagnosis depends clinically upon a history of pregnancy or abortion, with a frequently existing hydatid mole and possibly, I think

we may add, adherent or diseased placental sites, as in this case.

Some cases have been reported where there was no intrauterine disease (see Finley's reported cases in the *American Medical Journal,* November, 1904). The diagnosis, to be complete, must be confirmed by the microscope. When associated with the intrauterine and subjective symptoms, we have metastases; the diagnosis can hardly be mistaken. These cases occur earlier than any other form of malignant disease. In this case it appeared in five months after delivery. After metastases appear, operative interference is of doubtful expediency, though cases have been reported as cured even when metastases had occurred. Realizing this fact, I sent this case home on the day of examination, without operation. Could the disease have been recognized, on September 5, possibly an operation might have been entertained, but even then with doubtful results. The extreme malignancy and rarity of this disease makes it one of great interest, and must serve to put us on our guard.

I had raised the question in my own mind, whether the microscopic examination, alone, could be regarded as absolute in reaching a diagnosis, and I find that warning in Metcalf and Wafford's excellent article (*Am. Jnl. of Obstetrics,* September 1904) where they say that "there is a variety of appearances, within the normal—that the tissue from which this growth develops is essentially infiltrating, and even within normal limits, to a degree malignant, from the maternal standpoint." Here, as elsewhere the clinical aspect should combine with the microscopical in arriving at a diagnosis.

Later investigations would seem to indicate that the prognosis is not so bad as we had been led to believe, as quite a few recoveries, following extirpation, even in well advanced cases with matastases, have been reported. It is fair, however, to assume that the general condition of the patient must be the guide as to

whether an operation should be entertained, rather than the single fact that a metastasis had occurred. A low per cent. of hemoglobin, such as we are quite likely to have from repeated loss of blood, should serve quite as much to deter an operation as the metastases of malignant nature.

In reading the very interesting article of Dr. Schmauch (*American Journal of Obstetrics,* July, 1904), I am led to believe that the case I reported falls within what he terms rare cases, if he does not exclude proliferation. Quoting his language, he says: "There are only six cases reported, after labor at term, where the uterus has been free from growth; all of these cases ended fatally." In my case, there was no growth, simply an infiltration, and she went to full term, with no antedating history, which could suggest malignancy or abnormality of any kind. We observe that the older observations classing this condition as one of sarcoma, are not now tenable, nor is it to be classed as carcinoma, but rather as a proliferating growth, peculiar to itself, and in view of the physiologic behavior of the chorionic villi in dipping down into the uterine tissue, as it does, it seems strange even that these cases are not more common.

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DISCUSSION.

DR. ARCHIBALD MACLAREN, St. Paul, Minn.—We are all interested in these curious forms of malignancy. I have one case to report in which the diagnosis was made by a pathologist in St. Paul from a condition which I supposed, from its history, to be a soft edematous fibroid, coming on five months after delivery. Probably there was no growth present until after the delivery of the child; but there had been no extension

beyond the wall of the uterus itself. The fundus was diffusely infiltrated with this peculiar fungous mass, the like of which I had never seen before, and which I did not recognize. I sent a specimen to some of my pathologic friends, who afterwards examined it and returned it with the diagnosis of syncytioma malignum. The uterus was removed above the internal os, with the belief that it was simply an edematous fibroid, and it was treated like any ordinary supravaginal amputation. The woman at the present time, now a year since the operation, has shown no evidence of return of the disease, because it was confined entirely to the fundus, and there has been no extension of the disease to the lymphatics or neighboring tissues.

Dr. Arthur E. Hertzler, Kansas City, Mo.—I wish to say a word or two in reference to the microscopic report of this case. I stated that the masses resembled, or looked like decidual cells, and I expected that Dr. Crowell would draw attention to certain theories in regard to the formation of this class of tumor.

There is one caution to be thrown out to which Dr. Crowell drew attention, and that is, certain syncytial masses may closely resemble decidual masses. The syncytial cell in the chorionic villi, when cut across the end, is piled up. We may get this condition in retained placenta, in hemorrhage, etc., and infection along with it. I saw some of these things in the practice of a friend. The microscopic examination and the history as well may be delusive, and every precaution is necessary to prevent error. It has the appearance of a fingerlike projection which is characteristic of syncytioma. You never see that in the placental rests, no matter how long retained, or what the history is. These syncytial masses are long, some reaching clear across, even almost double the length of the microscopic field. We may find them in retained placenta a long time after abortion or labor, but particularly after abortion in the second or third month.

Dr. Crowell (closing the discussion)—In considering the essential features of these cases, I do not think the microscope alone, no matter how expert the microscopist, is sufficient unless we have a typical case. We must consider also the clinical history, and the question arises; Is it not too late with the possibility or hope of doing the patient good? It was not until I

read Findley's report that I came to the conclusion that even some of the late cases, as he reports, may be cured after the removal of uterine metastases.

There was another case which occurred in Kansas City, which I would like to have reported in full, but it was not satisfactory to those who want to report it ultimately. In this case one of the best surgeons we have, who stands at the head in surgery, saw the patient at the golden moment when an opportunity was afforded to do good, but because of a lack of pathologic conditions outside of the uterus, and knowing very little about the condition at that time, a diagnosis was not made. However, the abdomen was opened, closed, and the patient sent back home. Two months later she returned, when an operation was done, with a fatal result, because metastases had taken place, had spread to the broad ligament, and as he was unable to encompass the diseased area the patient died.

We should look into the clinical history, with a microscopic examination of uterine scrapings, in all cases of abortion and molar pregnancy, and even if in some of them we operate without good and sufficient reason the results may be favorable.

FRACTURES OF THE TARSAL BONES.

DANIEL N. EISENDRATH, A.B., M.D.
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The importance of the early diagnosis and institution of the proper treatment of fractures of the tarsal bones is well recognized at the present time. Prior to the routine use of *x*-ray pictures by progressive surgeons, injuries of these bones were thought to be comparatively rare, and many of the cases were treated as severe sprains, etc. In 1894 Gaupp (*Beiträge zur klinischen Chirurgie,* vol xi) was only able to collect 60 cases of fractures of the astragalus. In looking over the literature of the subject, the writer was surprised to find few cases comparatively of fractures of the other tarsal bones reported.

It is only within recent years that we have begun to diagnose fractures of the astragalus and calcaneus, and I shall attempt to show by the report of some cases the necessity of making such a diagnosis as early as possible.

Injuries of the other tarsal bones are so rare that I shall confine this paper to the consideration of fractures of the astragalus and os calcis.

Surgical Anatomy.—The principal points of interest in the surgical anatomy of these two bones are that the astragalus, through its articulation with the tibia and fibula, bears the entire weight of the body, with the aid of its fellow of the other side. This portion (trochlea) corresponds to the body of the bone, and in falls upon the feet we shall see how it is caught between the os calcis lying beneath it, and the malleoli, and thus crushed. The neck of the astragalus joins

the body with the head (the latter articulating with the scaphoid), as can be seen in an *x*-ray of a normal foot (Fig. 1). This narrow neck of the astragalus is the fragile part of the bone, and hence the most frequently broken.



Fig. 1.—X-ray of normal foot. F. fibula; T. tibia; 1, astragalus; 2, os calcis; 3, scaphoid; 4, cuboid; 5, cuneiform.

The os calcis placed beneath the astragalus assists it in supporting the weight of the body, and like it is subjected to a crushing force in falls from a height.

In addition, it has attached to its tuberosity the powerful tendo-Achilles, which I will show plays a

great rôle in producing fractures of this bone. The astragalus and calcaneous are firmly bound to the tibia and fibula, to the other tarsal bones, and to each other by strong ligaments, so that at times a force may tear such a connecting band of fibers or cause these structures to tear away a portion of the bone itself.

Mechanism.—Fractures of the astragalus and calcaneus may be produced in one of six different ways, given in their order of frequency:

1. Compression fractures (*par arrachement*). These form the larger number of the cases. They occur, as is shown in Cases 1, 2 and 3, reported below, by the patient falling from a height and striking upon the ground, so that the astragalus and os calcis receive the major part of the weight of the body. The latter is transmitted first to the astragalus, and then to the os calcis, which are wedged in between the bones of the leg and the surface struck, and are thus crushed or compressed, so that they break. Such compression fractures are frequently associated with fractures of the malleoli, or with dislocation of the astragalus. The plane of fracture varies. It may be horizontal, vertical or oblique. There may be simply a division of the bones into two large fragments, or they may be so splintered as to be scarcely recognizable.

2. Fractures of the neck of the astragalus following sudden dorsal flexion of the foot. In this variety the line of fracture is in the frontal plane, the anterior edge of the tibia impinging upon the neck, and thus cutting its way through. Such fractures are frequently associated with a fracture of the inner malleolus.

3. Fractures of both astragalus and calcaneus following forced supination or pronation of the foot. These are in all probability due to the fact that the interosseous ligaments have in many instances greater resisting power than the bones, and probably pull the bones apart, a variety of tearing fracture (*par ecrasement*) so well illustrated in the next method.

4. Fractures of the astragalus which result from forcible action of the muscles of the calf. In this variety the os calcis, as in Cases 4 and 5, is most frequently fixed, and the sudden contraction of the powerful gastrocnemius and soleus muscles really pulls the tendo-Achilles from its attachment to the tuberosity of the

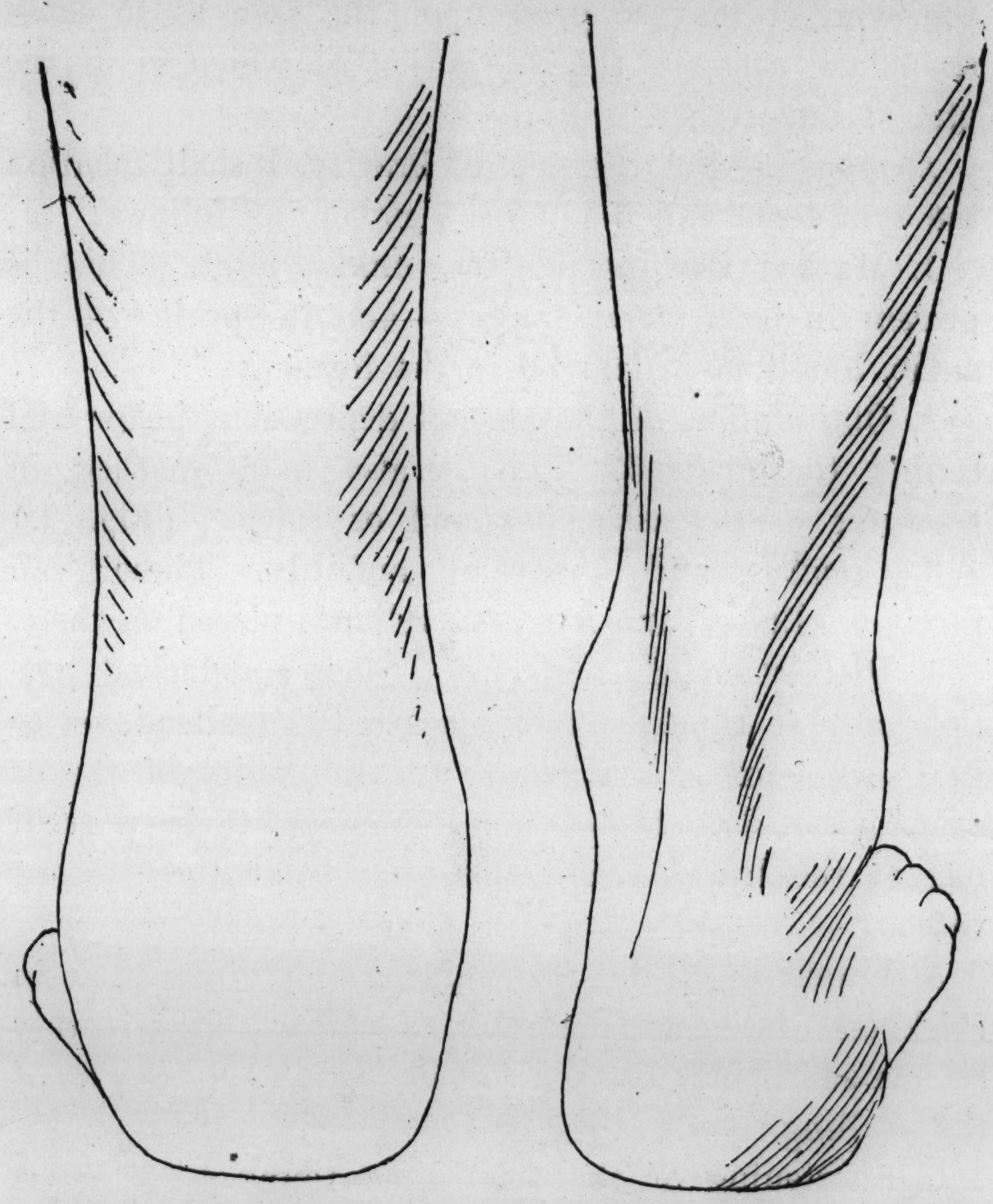


Fig. 2.—Outlines of normal ankle and of ankle after fracture of the tarsal bones. Note how depressions are marked in normal (right) ankle and are obliterated in pathological (left) ankle.

os calcis, or carries a portion of the latter with it (Fig. 6).

5. Crushing fractures. In this variety the other tarsal bones are also involved. It follows such accidents as being run over, etc.

6. Gunshot fractures.

All of these, with the exception of the last two, may be simple fractures, with or without noticeable displacement of fragments.

In many cases there is no important injury of the soft parts, the latter being usually found more or less contused. In other cases the fragments may penetrate the skin, or may so press upon the skin as to cause secondary necrosis, the prevention of which is of the utmost importance.

Diagnosis.—For the sake of brevity, I shall mention the symptoms and diagnosis together, as follows:

1. Marked swelling of the ankle joint. This is present in both tarsal fractures and in sprains of the ankle, but is more marked in the former.

2. Obliteration of the normal depressions below and behind the malleoli. This is also more marked in fractures of the astragalus and os calcis. (Fig. 2.)

3. Crepitus and abnormal mobility. These can rarely be elicited, and but little reliance placed on them.

4. Dislocation of fragments. Such a detached portion may at times be felt beneath the malleoli, or as in Cases 4 and 5 just above the tuberosity of the os calcis (Fig. 6). If felt and recognized to be part of one of the tarsal bones, this sign is of the greatest value.

5. Lowering of the malleoli through diminution in thickness of the astragalus or os calcis. This is very seldom sufficiently marked to be of value, on account of the swelling.

6. Shortening of the foot when found is of great value.

7. Abnormal positions of the foot, such as pes valgus or pes varus, if fixed, are also of confirmatory value.

8. X-ray examination. This has been adopted as the most accurate means of diagnosis. In every case one should, however, compare the picture of the injured foot with an *x*-ray of the normal one.

9. History of the injury is of great value as it so

frequently follows falls from height or forcible dorsal flexion of the foot or when the heel is caught and the body falls forward.



Fig. 3.—Illustrates Case 2. Compression fractures of the astragalus and os calcis. Note the two fragments of the astragalus (a) and the comminution of the os calcis (c).

To sum up, the following are of the greatest value in making a diagnosis of fractures of the tarsal bones, viz., palpation of a fragment, pes valgus, or varus,

traumaticus, the *x*-ray examination, and the history of the case.

Treatment.—Treatment varies according to conditions, as follows:

1. *In simple fractures without displacement.* In these the foot should be immobilized at right angles, best of all in a removable cast, well padded around the ankle and heel. Massage should be begun on the third or fourth day, in order to reduce the peri-articular and intra-articular effusion, and prevent atrophy of the leg muscles. The cast should be worn for six weeks, and at the end of this time the patient gradually permitted to put his weight on the foot. Convalescence may be delayed, as in many cases of simple sprain, by the presence of a flat foot (pes valgus traumaticus) following the injury. The pain and discomfort caused by this condition can be quickly relieved by a suitable steel insole.

2. *In simple fractures with displacement.* If there is the least danger of secondary necrosis of the skin through a fragment impinging on it, is is best to convert the fracture into a compound one, taking extraordinary pains to secure aseptic surroundings, etc. If the fragments lie laterally, they can be easily removed. If a fragment lies behind the ankle and is complicated by detachment of the tendo-Achilles, the latter should be sutured, as in Case 4, to the body of the os calcis. If either the astragalus or os calcis are so badly splintered as to render their retention impossible, they may be removed without marked loss of function in the foot.

3. *In compound, crushing and gunshot fractures of these bones.* One should be guided by the same rules as apply elsewhere in the treatment of such injuries of the extremities.

Case 1.—Compression fracture of os calcis, secondary necrosis of skin, acute septic infection, amputation of leg.

J. L., engaged as painter in the Stewart building,

of Chicago, was working at the level of the eighth floor of the elevator shaft, when his scaffolding was struck by a neighboring elevator cage during its ascent, and

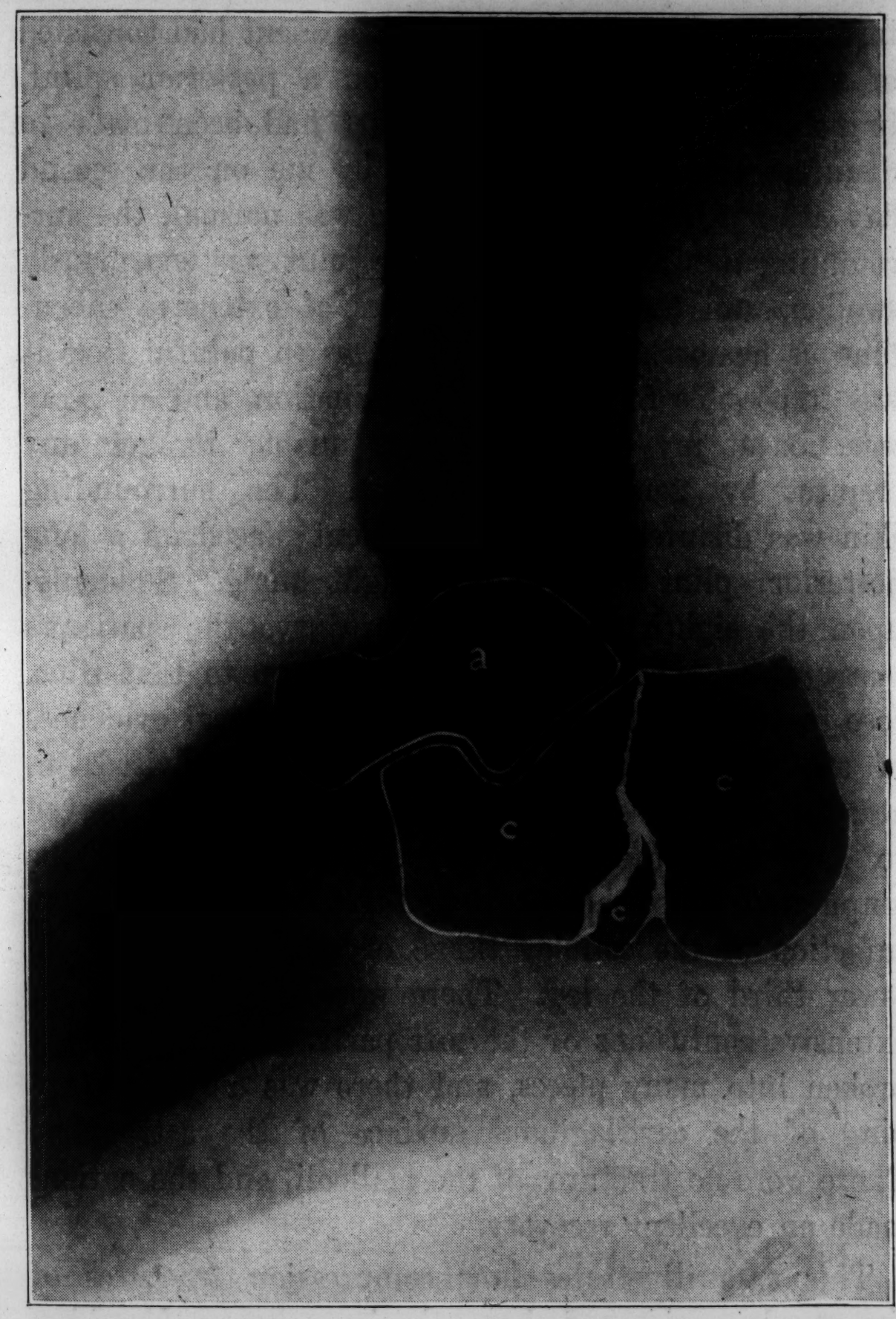


Fig. 4.—Illustrates Case 3. Compression fracture of os calcis. a, astragulus; c, fragments of os calcis outlined in white; the heavy white lines are the spaces between fragments.

patient was thrown to the bottom of the shaft, a distance of eighty feet. He stated that he had tried to grasp some of the ironwork of the floors when falling,

and this probably broke to some extent the force of the fall. He fell directly upon the sole of the left foot, and was conveyed to an adjacent hospital. I did not see this patient until the second day after the injury. Prior to that time the treatment had consisted of simply placing the patient on a posterior splint, immobilizing the limb. No effort had been made to disinfect the skin. When seen by me on the second day after injury, his temperature was normal, the surrounding tissue around the ankle joint was enormously swollen, and there were evidences of extensive subcutaneous hemorrhages. The foot was so painful that it was impossible to make any examination, and an *x*-ray was not at my disposal. I was unable to get any crepitus by gentle manipulation. The surrounding skin was disinfected, and the patient placed on a long posterior splint with foot at right angle. Suddenly, upon the eighth day after the injury, the patient's temperature, which had been normal up to that time, rose to 103°, pulse 140, and there were local evidences of an acute infection. Amputation was advised, on account of the severity of the infection, and proved to have been the wisest plan. Examination of the amputated limb showed that there was an extensive infection of the cellular tissue of the entire foot and lower third of the leg. There were also evidences of extensive contusions of the soft parts, the os calcis was broken into many pieces, and there was a slight chipping of the cartilaginous surface of the astragalus. There were no fractures of the malleoli, and the patient made an excellent recovery.

This case illustrates how compression fractures of the os calcis arise and shows the importance of making a diagnosis of the condition at as early a time as possible, in order to avoid what must have undoubtedly been the chief etiologic factor in producing the sepsis in this case, and that is the secondary necrosis of the skin through impingement of the fragments upon it.

Had this case been recognized at once as one of compression fracture of the os calcis, and a careful search made for fragments which might interfere with the circulation of the skin, I have no doubt that we could have avoided the unfortunate necessity of amputation.

CASE 2.—E. W., aged 48; was admitted to my service in the Cook County Hospital with a diagnosis of a severe contusion of the foot and sprain of the ankle

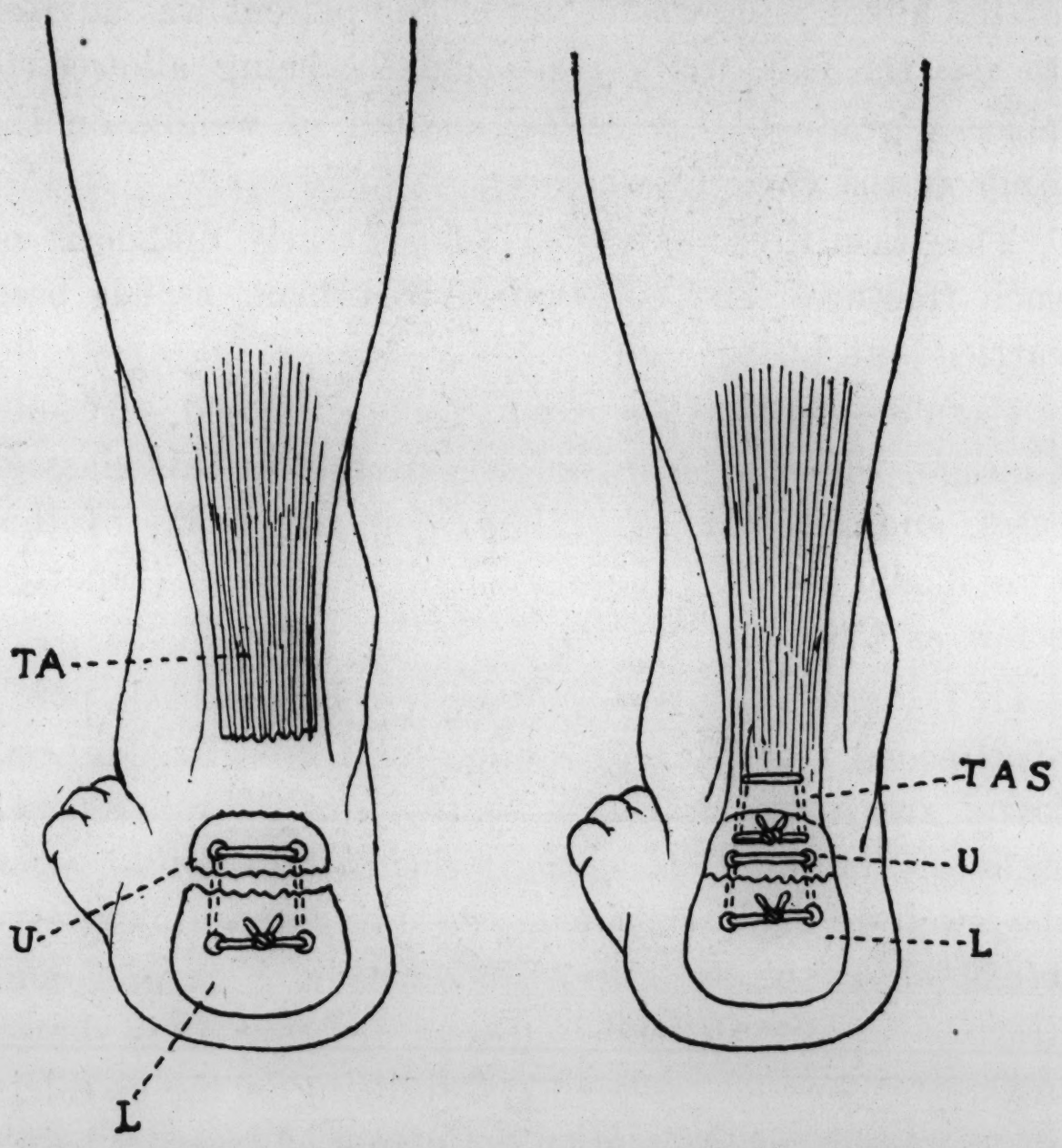


Fig. 5.—Method of suturing fragments and tendo Achilles in Case 4. TA, tendo Achilles before suturing; TAS, same after suturing; U, upper fragment; L, lower fragment.

joint, having fallen 40 feet from a shed, and landing on his feet. Examination showed the enormous swelling around the ankle joint and obliteration of the depressions which normally exist in front, below and behind the malleoli (see Fig. 2). We were suspicious on account of the severe pain and the enormous amount of swelling, of a fracture of the os calcis or astragalus,

and an *x*-ray was taken. It showed, as can be seen by reference to figure 3, an extensive comminution of the os calcis and a fracture of the body of the astragalus, confirming our previous suspicions. The skin of the foot and leg was carefully disinfected, and the limb placed in a removable cast, which was left on about six weeks. From the second week on massage was given, and at the end of the fourth week passive motion of the ankle joint was begun. The patient was advised to use the cast for another month, being allowed to place a gradually increasing amount of weight on the limb at the end of six weeks.

This case illustrates the value of early diagnosis of such fractures, and the typical treatment, as has been carried out by the author.

Case 3.—In the case of Dr. Sidney McLeod, of South Chicago, who had heard of my interest in this class of cases, and was kind enough to send me *x*-rays of this Case 3, and also of a case similar to my Case 4 (reported below as Case 5).

G. G., aged 35; laborer. Fell from the back porch of a second story, lighting upon his feet. Dr. McLeod found great discoloration, crepitus, and the other usual signs of fracture. He placed the foot in a cast after the swelling had subsided. A skiagraph taken six weeks after the fracture is shown in Figure 4 and illustrates again the same class of fracture as is shown in Case 2 of my own, namely, a splitting of the os calcis into a number of fragments, the planes of fracture being vertical or diagonal to the long axis of the bone. This patient was placed in a cast and made a good recovery.

Case 4.—Mrs. C. V. A., aged 52. On Oct. 20, 1903, was getting out of her carriage, and had one foot on step of latter, and the other (injured one) on stepping stone, when her horse, which was headed south, was run into by a runaway horse. The shaft of the Stanhope buggy to which this second horse was attached, ran into Mrs. V. A.'s horse, and knocked it over. In

falling, her horse threw her backward and fell directly upon her foot and leg. She was wearing a French-heeled shoe, and her foot was held as in a vise between

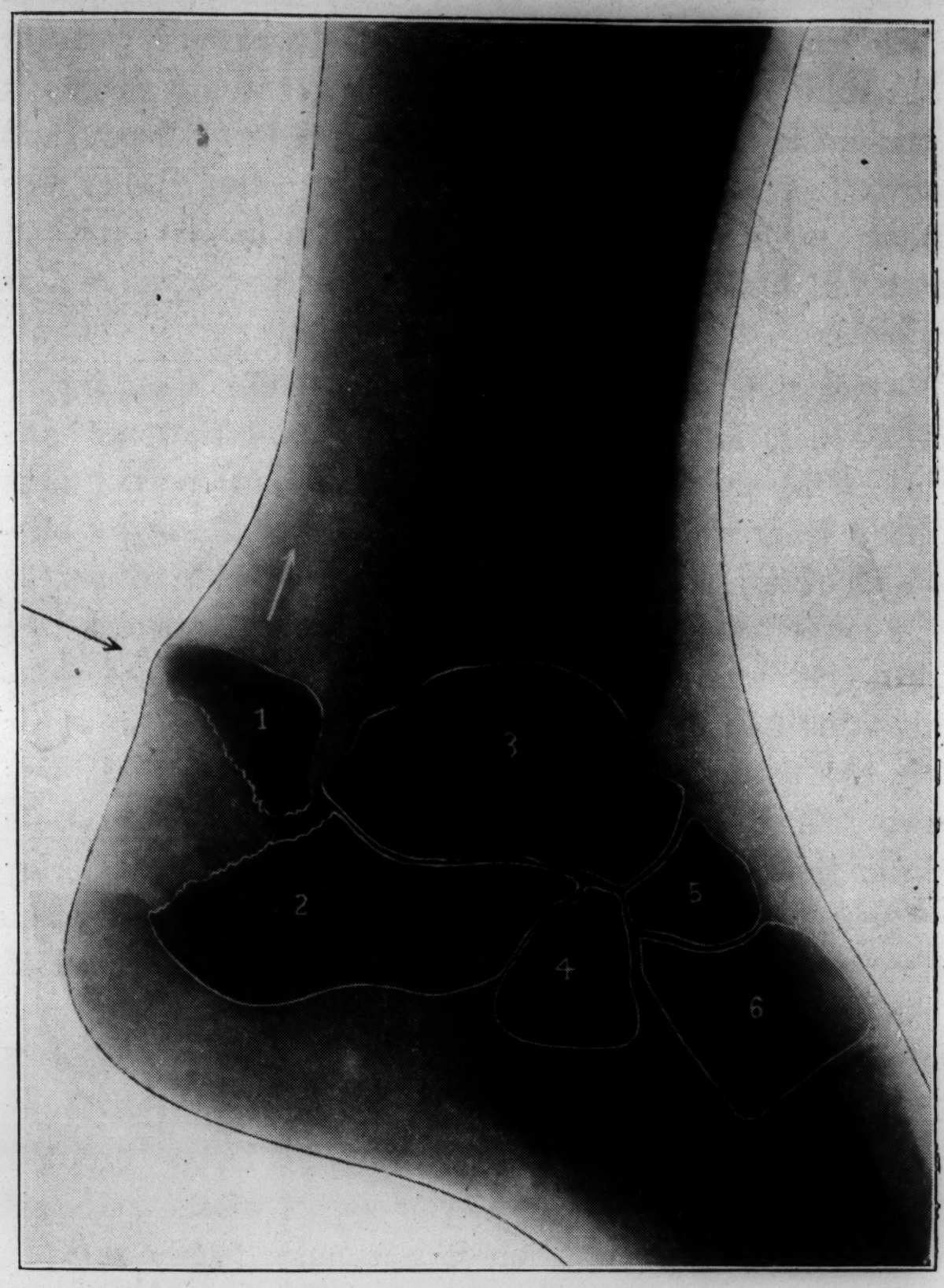


Fig. 6.—Illustrates Cases 4 and 5. Tearing fracture of os calcis when heel was fixed. White arrow indicates direction of traction of tendo Achilles. 1, upper or torn off fragment; 2, main portion of os calcis; 3, astragalus; 4, cuboid; 5, scaphoid; 6, cuneiform.

the stepping stone and a low circular iron fence to the north of it. She states that as soon as the horse fell upon her, she experienced an excruciating pain in the left heel, and then fell backwards into the grass plot.

She was referred to me by Dr. M. L. Goodkind, with the diagnosis of a probable fracture of the os calcis.

Upon examination, patient was unable to extend foot. Just above heel there was a sharp projection, which felt firm, like a fragment of bone. It was just beneath the skin. The latter was very thin over it. A diagnosis was made by both Dr. Goodkind and Dr. Schram and myself of a fracture of the os calcis. Our theory was that the foot had been caught so as to fix the heel and her fall backwards had caused a fracture by muscular violence.

Operation, on Oct. 22, 1903, second day after injury at Chicago Baptist Hospital. After most thorough disinfection, and with Esmarch applied, an incision was made from the junction of the lower and middle one-third of the leg along its median posterior aspect to the lower border of the heel. The fragment which had projected was found to be a portion of the os calcis, about half an inch thick, which had been pulled upwards by the tendo-Achilles and tilted upon edge. It was also found that the tendo-Achilles had been torn loose from this fragment with the exception of its posterior edge. The foot being forcibly extended by an assistant, the small fragment (u) of the os calcis was sutured to the main portion (l) of the bone by mattress sutures of kangaroo tendon (Figure 5). A mattress suture of kangaroo tendon was then passed through the lower border of the tendo-Achilles, and the latter brought somewhat closer to the posterior aspect of the os calcis than normal. In addition it was more firmly sutured to the periosteum of the main fragment of the os calcis by a number of sutures of medium catgut. Normal temperature followed operation. First change of dressings on Nov. 3, 1903. Primary union of cutaneous wound. Silkworm gut sutures removed. Limb again placed in plaster cast, with foot in extreme extension.

The wound healed by first intention, and the functional result has been as perfect as could be wished

for. She was able to extend and flex the foot as fully as on the normal side. This case illustrates first, the importance of making an early diagnosis of a tearing-off of a portion of the os calcis, on account of the danger of secondary necrosis over the point where the fragment impinges on the skin. Secondly, the treatment instituted here is to my mind the ideal one, when seen early enough by the surgeon. I would, however, advise against converting such a fracture into a compound one, that is, cutting down upon the point of fracture and suturing the fragments with Kangaroo tendon or some other material which will hold the bones together for a sufficient length of time, in those cases in which there is no fragment close under the skin, and in which extension of the foot brings the fragments closely together, as well as in that class of cases where aseptic surroundings can not be secured. Unfortunately, I was obliged to take the patient to a hospital where there was no *x*-ray apparatus, so that it was impossible to secure a picture of the condition before operation, and the diagnosis was made entirely upon the palpation of a fragment projecting just above the tendo-Achilles, and immediately under the skin. Through the kindness, however, of Dr. McLeod, I am able to give an exact reproduction of the conditions existing in my patient before operation, owing to the fact that he was fortunate enough to secure an *x*-ray of an almost identical case. (See Fig. 6.)

Case 5.—Fracture of os calcis by muscular contraction, causing a tearing off of a large fragment of the os calcis from the main portion of the bone. (Dr. McLeod's case.)

Mrs. R., aged 62, while walking on a sidewalk, stepped on a rotten board, allowing the heel to go through it with practically no resistance. She fell forward, throwing all of the body weight on the ball of the foot. When first seen by Dr. McLeod immediately after the accident, the detached fragment was almost

through the skin. She would not consent to operation until two days had elapsed, when an area of skin as large as a quarter, lying just over the fragment, became necrotic. She was taken to the South Chicago Hospital, where the *x*-ray shown in Figure 6 was taken. Dr. McLeod made a straight incision over the tendo-Achilles and os calcis, brought the two fragments of the os calcis together with an ivory spike, re-enforced by two heavy sutures of catgut. In order to suture the skin it was necessary to cut away necrotic tissue. Good bony union resulted, but the tendo-Achilles became somewhat necrotic, but the final result has been satisfactory.

My conclusions are:

1. The astragalus and os calcis bear the entire weight of the body.

2. They are most frequently broken in falls from a height directly on the feet (compression variety) or by tearing off of a portion of one of the bones either when the heel is fixed or sudden supination or pronation or in forcible dorsal flexion of the foot.

3. Early diagnosis, on account of the danger of sepsis from secondary skin necrosis of great importance.

4. If no displacement of fragments treat by cast for six weeks with early massage. If displacement threatens necrosis of skin convert into open fracture and remove fragment or suture it.

DISCUSSION.

Dr. Van Buren Knott, Sioux City, Iowa—I wish to describe briefly a case that I saw three or four years ago, which demonstrates the importance of making a diagnosis of these injuries, and of treating them along the lines suggested by the essayist. I saw the patient about four years after the original injury. At that time she had a foot which was absolutely useless; she had been walking on crutches for two or three years, being unable to bear any weight on the foot. Examination demonstrated ankylosis with extreme deformity and it was concluded that nothing short of amputation

should be done. Amputation was made at the lower or middle third of the leg. After dissection of the specimen, an interesting condition of affairs was brought out. There had been fracture of the neck of the astragalus, with dislocation of the bone, and fracture of the os calcis. The accident had not been recognized as anything but a sprain, and was not treated. Following the accident and lack of treatment, there was complete ankylosis between the four bones. The os calcis, astragalus, tibia and fibula were bound together by new bone tissue. These four bones came out as one bone bound together by large deposits of new bone formation. The woman had to lose the leg because the original accident was not recognized and treated properly.

Dr. J. F. Percy, Galesburg, Ill.—I am particularly interested in this class of cases, although I have had no cases of fracture of the astragalus. I have had, however, two cases of dislocation, and in these the question will arise as to whether there exists a fracture or a dislocation.

Last winter, while sitting in my house, I saw a man on horseback, and the horse fell with him. He got up and mounted the horse. His foot hurt him and he came into my yard. I saw him immediately, and with help he entered the house, when I recognized by examination that he had a dislocation of the astragalus. The bone was turned completely over toward the inner side, entangling with it—of course, I could not make that diagnosis beforehand—the head of the flexor longus hallucis. My man of all work is an amateur photographer, and he took photographs of the foot immediately, before any swelling occurred. The foot was also put under the *x*-ray, the conditions recognized, and the removal of the bone advised. This was submitted to, and was done the next morning. As I have said, I found the tendon of the flexor longus hallucis entangled in the head of the bone, so that there was absolutely no way of reducing that dislocation. Therefore, with what Dr. Knott has said in reference to his case, and what has been reported in the paper, it is evident that it is most important to make a correct diagnosis at once, and to institute treatment such as was followed in this case of mine, i. e.. if it be one of dislocation, and I may add that at the present time the man, who is a workingman, has an absolutely use-

ful foot. In fact, he has to stop to think which foot it is that was injured. There seems to be no shortening, and when you see him walking along the street, one does not notice any interference with locomotion.

I have seen another case of the same kind recently, in which the condition, which so often follows in this class of injuries, is now present, that is, an absolutely painful foot, in which the individual is incapacitated, practically, from all work requiring the use of his feet. He has refused operation, although undoubtedly he will submit to it eventually, as the other patient did. These accidental injuries of the feet are among the worst which we are called on to treat, and I am glad to know that Dr. Eisendrath has had the opportunity of treating so many of them, and, as a result of this experience, is able to lay down so clearly the rules for their correct management.

Dr. D. S. Fairchild, Des Moines, Iowa—A number of cases of injuries of this kind have come under my observation, mostly in connection with railway surgery. There is one case in particular that I desire to call attention to, and that is a case of fracture of the os calcis directly in front of the attachment of the tendo-Achilles, or pretty well in front of it. The contraction of the muscle resulted in a considerable degree of displacement, which I could not correct. The injury was caused by the passage of a wheel over the foot while the foot was resting upon a rail. The skin and soft parts on one side were extensively lacerated, and while the bone was not exposed, it was easy to feel the location of the bone. By making an incision on the opposite side, so as to get my finger on one side opposite the other, I pulled the fragment down, attached it to the main part of the os calcis, by an eightpenny and tenpenny wire until it united. This young man has been working for ten years since as a freight brakeman.

Dr. C. O. Thienhaus, Milwaukee, Wis.—This subject of fractures of the tarsal bones is very interesting to me, and I will take this opportunity to cite a case of fracture of the astragalus complicated with subastragaloid forward dislocation of the foot on which I operated about seven months ago. Subastragaloid dislocation of the foot following fractures of the astragalus may take place in four directions. First, forewards. This occurrence is enormously rare. So far as

I remember only four such cases have been collected in the whole world's literature, and I will take the liberty of demonstrating this afternoon the *x*-ray pictures of the fifth one observed by myself; second, subastragaloid dislocation of the foot to the inner side (which is the most common); third, to the outer side; and fourth backwards.

My case is the following:

A miner while working in a mine fell from a height backwards, a number of rocks falling with him. He landed on his feet and after being extricated from the rocks, it was found that his left ankle was swollen and the foot dislocated forwards. An immediate attempt was made to reduce the dislocation under narcosis, but it proved unsuccessful.

When I saw him, four months after the accident, his foot was standing in a decided varus position and seemed largely elongated. As the case was of four months standing, I removed the entire astragalus, using an incision extending from six centimeters above the external malleolus down parallel to its posterior border to the tip of the external malleolus, from there in a curved direction to the middle of the foot on its dorsal side. (Recommended by Lauenstein.) As both peronei tendons were crossing the field of the incision and could not be retracted sufficiently to clear the field of operation, these were divided and sutured together after the removal of the astragalus. The result has been very satisfactory.

To-day, seven months after the operation, he is able to perform all work required in the mine, a new joint having formed between the outer and inner condyles and os calcis.

There are two or three cases cited (one by Mikulicz) in which the entire astragalus has been removed with excellent result.

DR. EISENDRATH (closing the discussion)—I am very much indebted to the gentlemen for the interest they have taken in this subject, and my chief reason for presenting it was that since the discovery of the *x*-ray we have been able to do much more for these cases than formerly. The cases of dislocation of the astragalus mentioned by Dr. Percy are interesting, and, of course, in my paper I did not discuss the differential diagnosis between dislocation of the astragalus and fracture, with

dislocation, as I thought it would make the subject too extensive, and I tried to make my paper as brief as possible. From what I have learned from the literature, and from Dr. Percy's case, it is remarkable how little difference in the action of the anklejoint it makes to remove the astragalus. Several writers report cases in which they performed that operation. One such case is mentioned as having been operated upon in von Bergmann's clinic, and referred to in Bruns-Mikulicz's Surgery, in which the functional result was perfect.

In regard to the mechanism of fractures of the os calcis or the manner in which they occur, in my case a fragment projected posteriorly beneath the skin, with the foot in the extended position. It is a question whether the mechanism is one of contraction of the muscles, as in the two cases cited by Dr. McLeod and my own, or whether the heel is fixed, and then, with a sudden forward turn of the body, fracture of the os calcis occurs. It is a question whether this is not the real etiologic factor in the fracture of this bone, rather than a contraction of the tendo-Achilles. I believe the former, although my patient stated that so far as she could remember she did not fall forward. In Dr. McLeod's case this was the chief cause of the fracture; that is, it was really not a fracture by muscular violence, as in fractures of the patella, but a tearing-off fracture. A case has been reported here in which the anatomic specimen examined was of great interest, verifying the necessity of trying to do something for these cases, and not making the mistake that has been so frequently made of diagnosing them as severe sprains or sprains of the ankle joint proper, or sprains of the intratarsal bones.

PTOSIS OF THE ABDOMINAL AND PELVIC ORGANS.

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Surgeon to and Medical Director of the North Pacific Sanatorium,
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I wish to begin by presenting a cross-section of an architectural design of a chamber for transporting a number of delicate instruments with the least possible concussion. Figure 1.—The chamber will consist of an outer wall, (a) more or less firm, a ceiling (b) suspended from the joists by ropes for lowering and elevating it, and a lining (c) which is firmly attached to the ceiling and is loosely attached to the outer wall of the chamber by a large number of elastic cords (d) attached to every part of its outer surface. These cords keep the lining stretched in all directions. Some instruments are suspended in sacks (e), made by infolding the lining, others by being placed back and above the lining (f). Another which must be suspended in an upright position with its open mouth down (g) and well below the lining, is suspended by an infolding from below upward, which pocket will include about two-thirds of the instrument. The lining is solidly fastened to the front and back flat surfaces (h). Guy-ropes (i) are attached underneath the lining of the chamber so that a perfect poise may be maintained, no matter what position the chamber occupies. After we have suspended all of our instruments satisfactorily, the chamber is closed. We then discover that we have left out an instrument (1) which has no pocket built

for it. So we open the lining and attach it by a cord (j) to the inside, and temporarily use inelastic twine (k) to reinforce the elastic bands locally as they are not prepared for the extra weight. As soon as we get

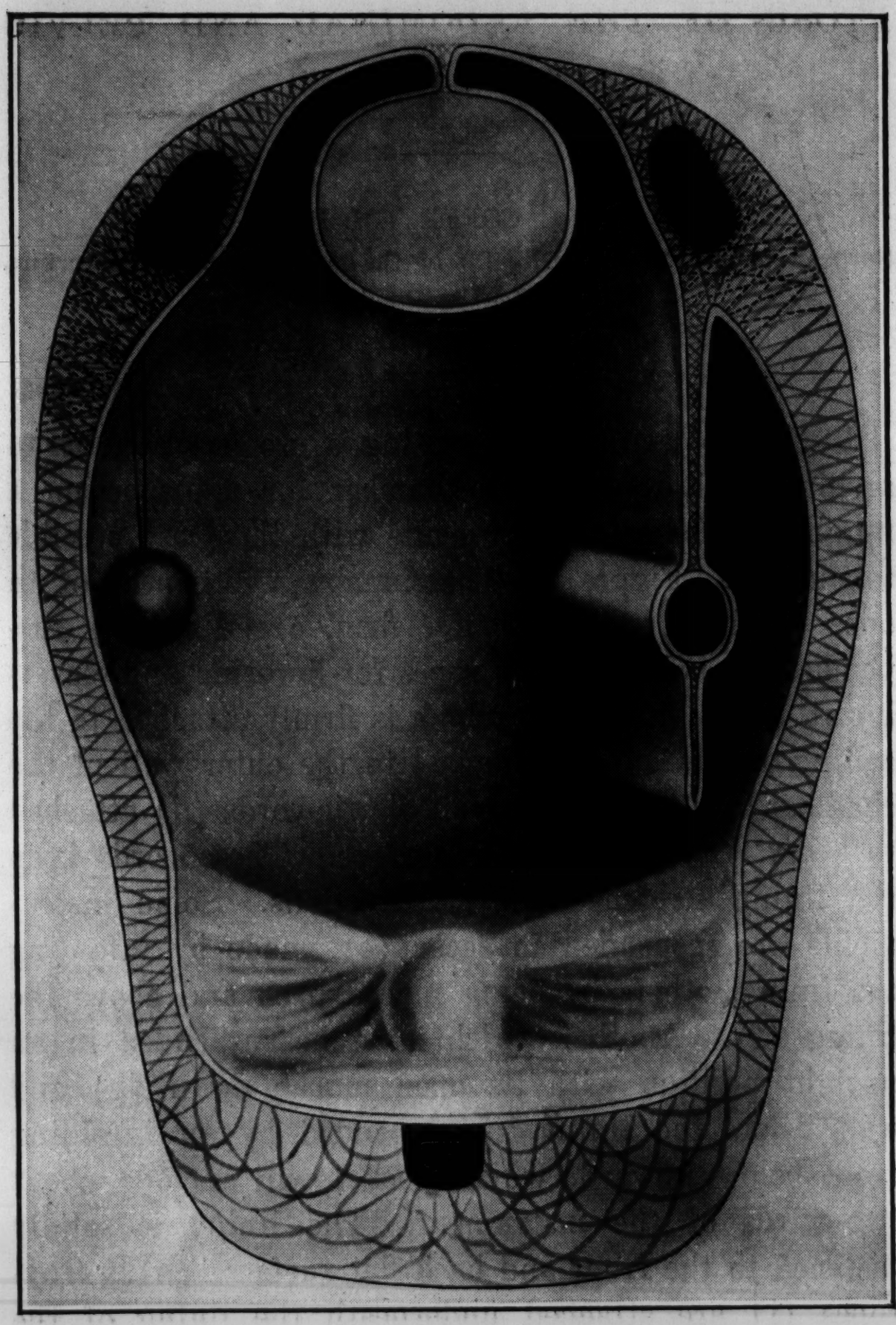


Fig. 1.—Cross section of a chamber made to illustrate the methods of hanging or suspending used in the abdominal cavity. (Description given in text.)

the elastic bands, we remove the inelastic twine, and put them in to reinforce the elastic bands already pres-

ent, after which this instrument has the same elastic support as the others.

These features are all intended to represent the counterpart of some part of the abdomen, its walls or

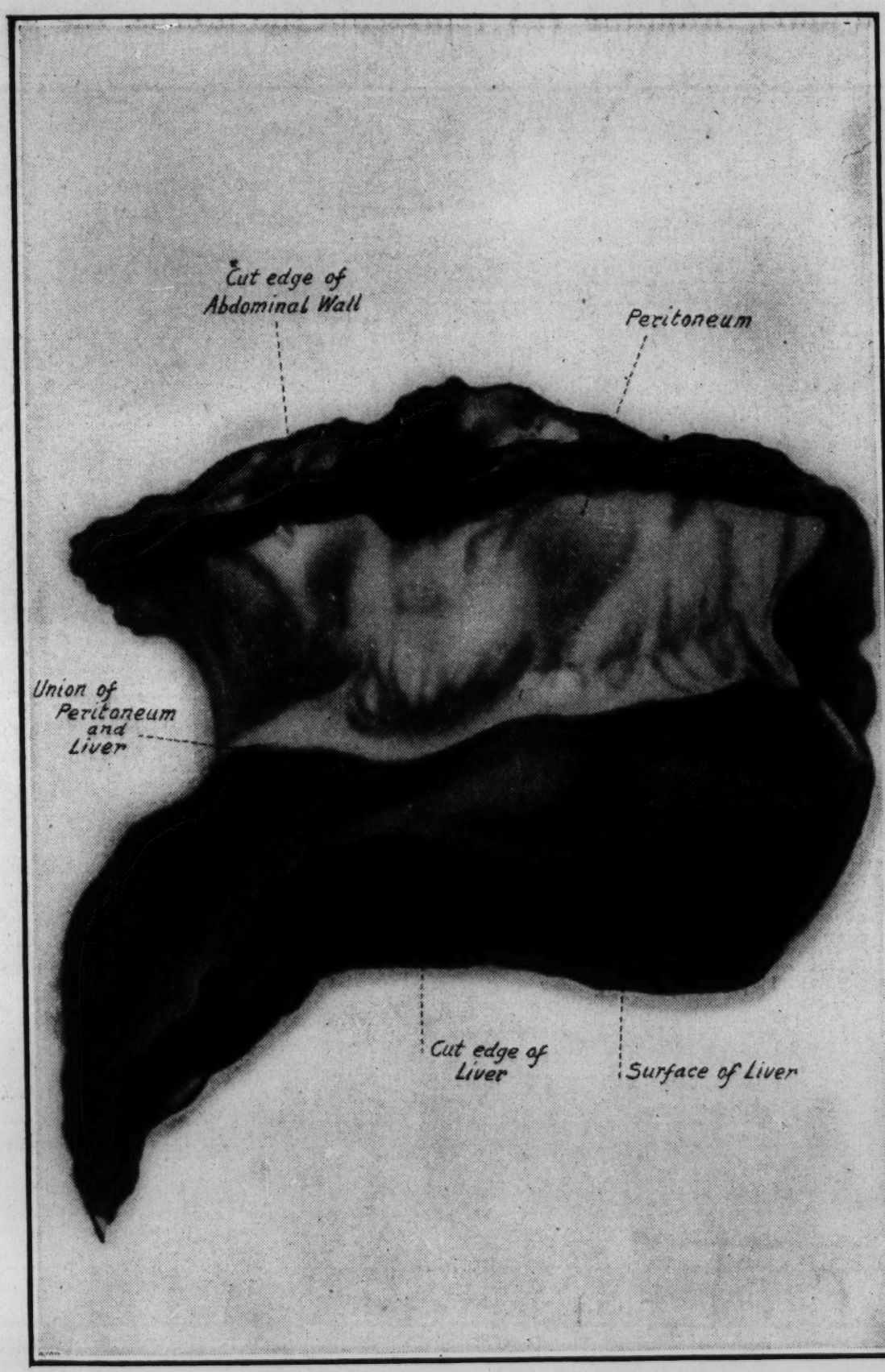


Fig. 2.—Specimen from a pig's liver which was sutured to abdominal wall six weeks before removal.

its contents. The wall of the chamber (a) represents the abdominal wall; the lining (c) the peritoneum; the movable ceiling (b) the diaphragm, the guy-rope suspending it, the muscular part of the diaphragm; the

upper infolded sack (e) the method of suspending the liver and spleen; the lower infolded sack (e) the method of suspending the stomach and intestines, the dark bodies outside the peritoneum (f) the kidneys. The lower infolding (g) represents the uterus, the guy-

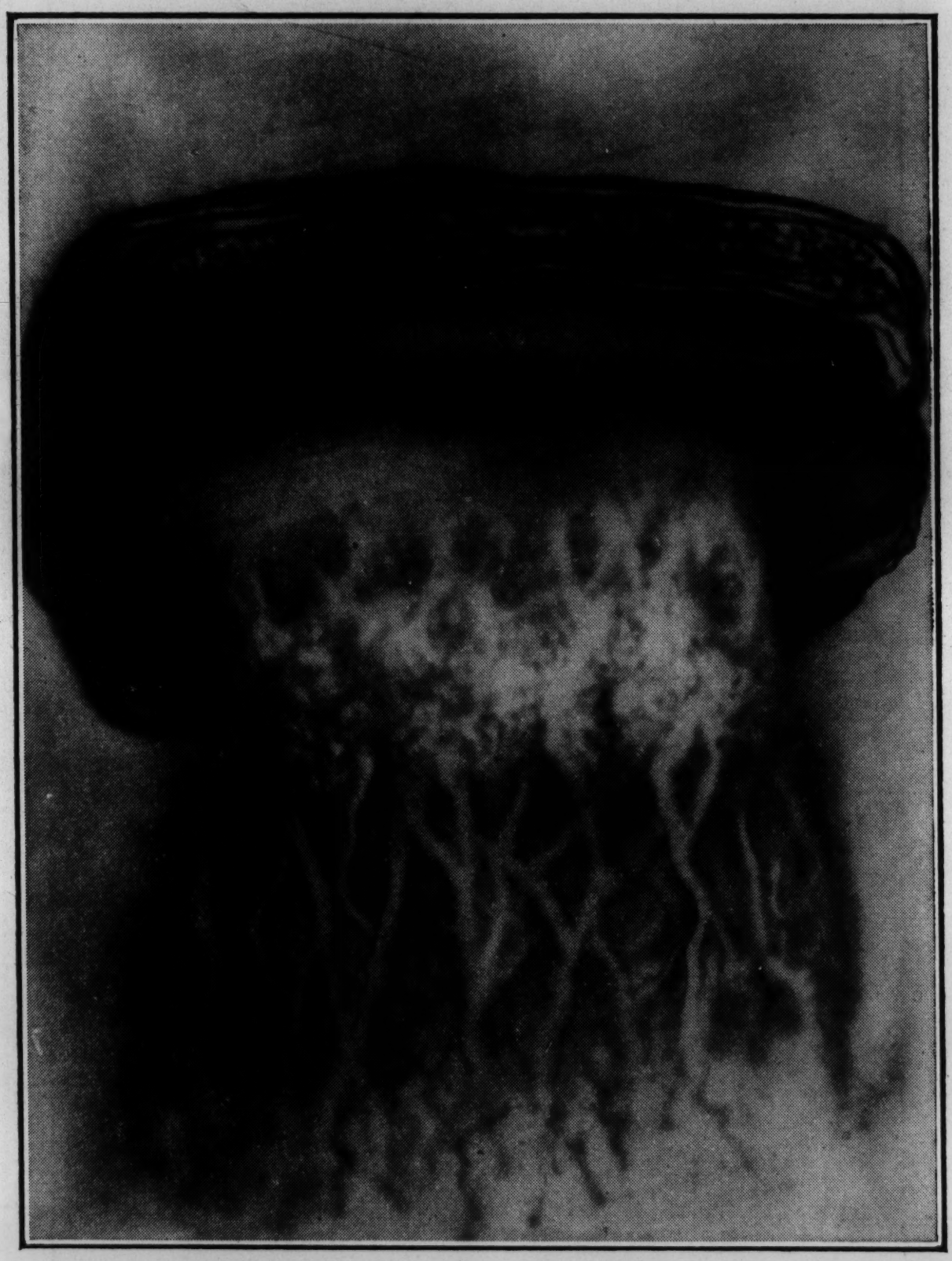


Fig. 3.—Omentum of pig sutured to abdominal wall six weeks before removal.

ropes (i) the true or muscular ligaments of the uterus. The marks or elastic bands between the wall and lining (d) represent connective tissue. Then the attached foreign body inside (1) is intended to represent the

gross pathology following the hanging of an abnormal weight to the parietal peritoneum in the manner used for ventro-suspension. The dotted lines (k) represent temporary exudate which first fixes the periton-



Fig. 4.—Shortening of a pig's mesentery.

eum to the wall, but is afterward absorbed and replaced by an increase of the normal connective tissue. I believe that the peritoneum is the direct and universal suspensory support of the organs of the abdominal

cavity, and that its only fixed attachment is to the diaphragm. The loose connective tissue holding it to the wall is probably the agent which carries most of the weight of the organs under ordinary circumstances.



Fig. 5.—Mesentery which was shortened six weeks before removal.

This elastic tissue is very much increased around the point where the weight of each organ is most felt, as at the supporting ligament of the duodenum, the mesentery, and the connective tissue around the kidneys. The

uterus is swung in the bottom of the entire sack or lining, and may be made to pull on all parts of the peritoneum from the diaphragm down as well as upon the connective tissue holding it to the wall.

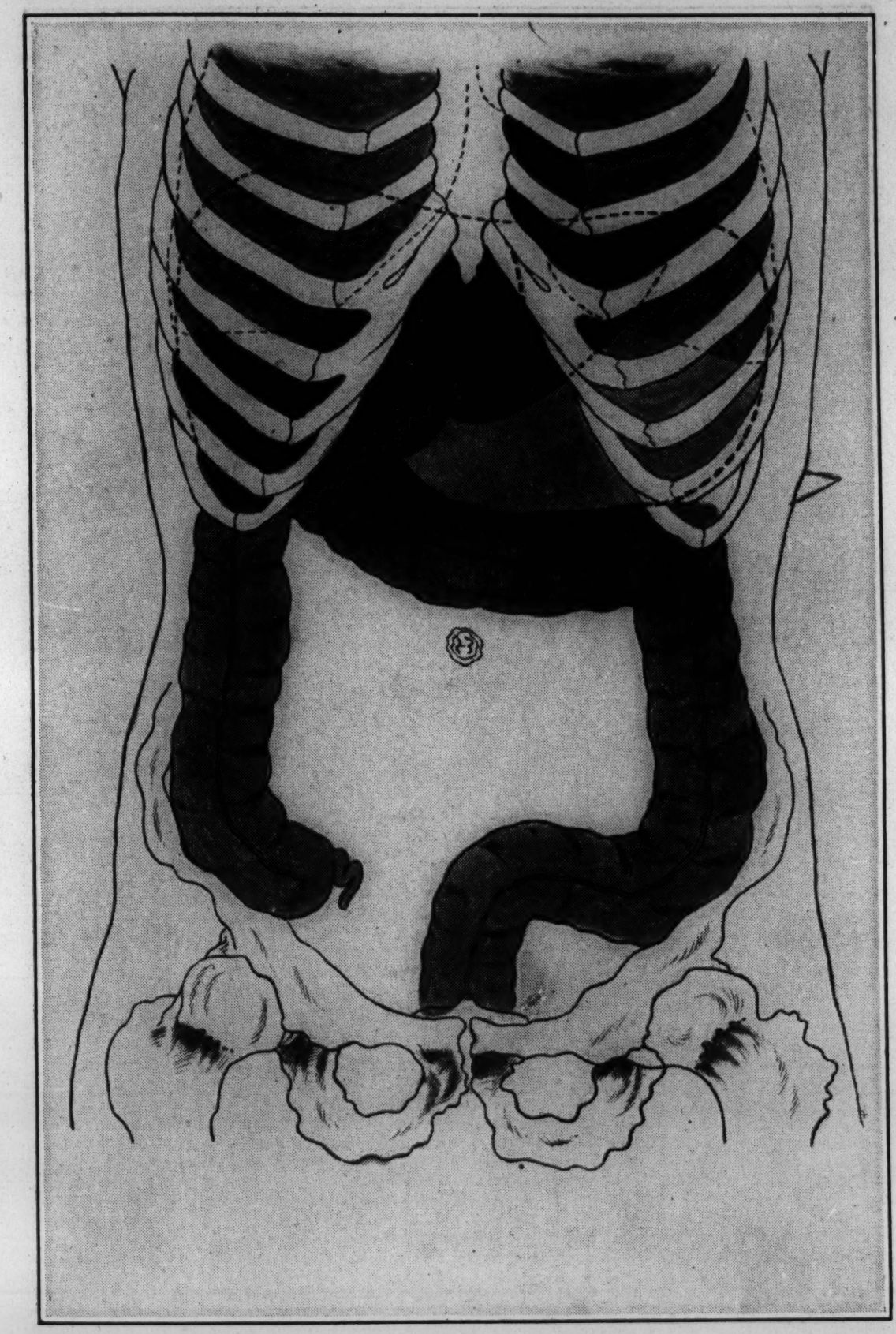


Fig. 6.—Normal position of liver, stomach and large intestine. (Taken from Deaver to use as model for following pictures.)

Inasmuch as the so-called true ligaments, including the round, utero-sacral, and utero-pelvic, are chiefly muscular fibers, the function of suspensory ligaments can scarcely be attributed to them, for a muscle

will never act continuously, always acts interruptedly, and is intended to produce motion exclusively. They are eminently fitted, however, for maintaining the normal poise of the uterus to suit the changing position of the

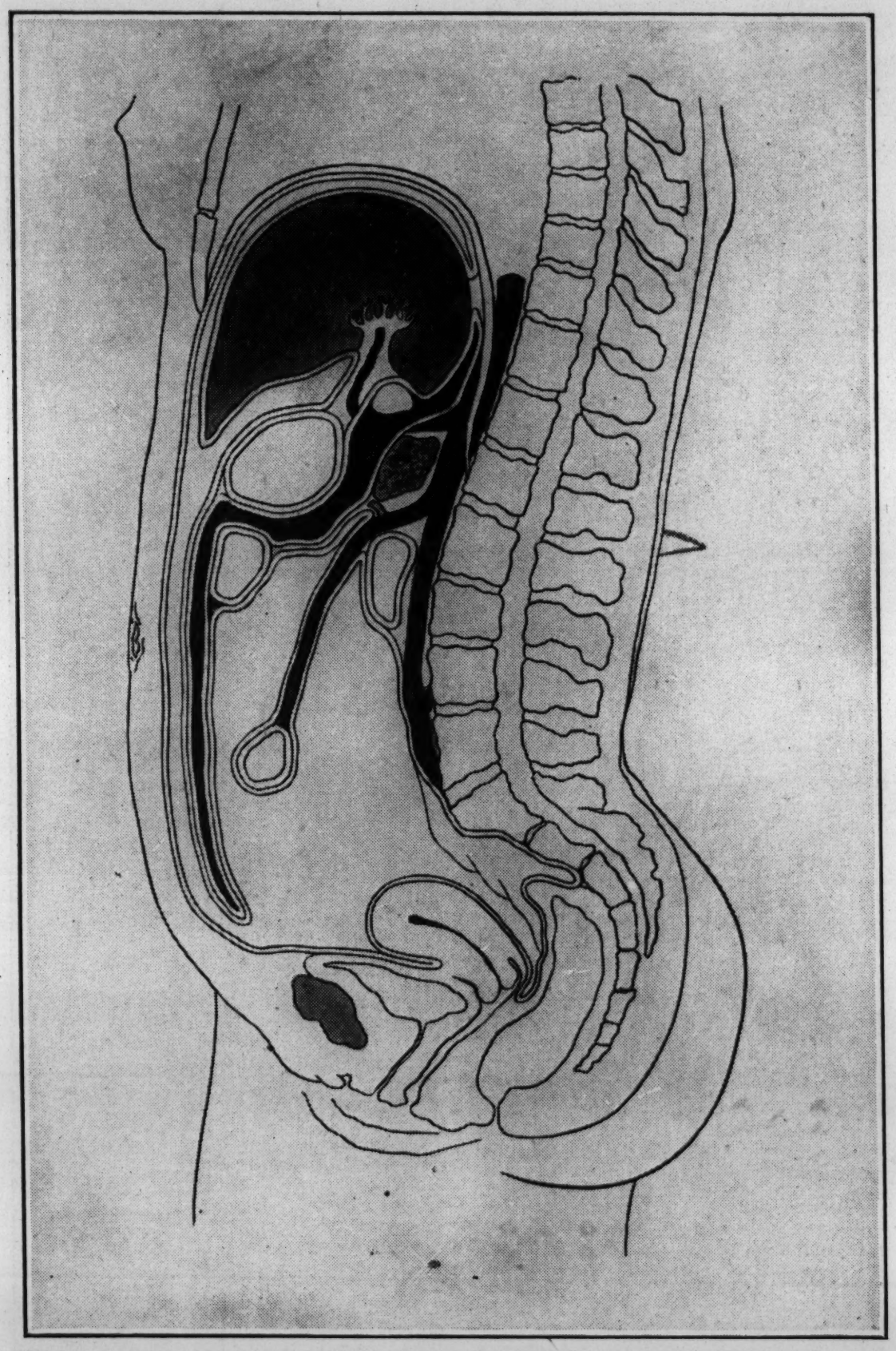


Fig. 7.—Normal relations of abdominal organs as seen in antero-posterior section. (Taken from Deaver to use as model for following pictures.)

body or in lifting it higher up into the pelvis, or changing its position for other reasons which we do not understand. I believe the suspensory function has been

attributed to them largely because of the great amount of suspensory ligament (peritoneum) always found in the neighborhood of the true ligaments, also a large amount of connective tissue. According to this theory,

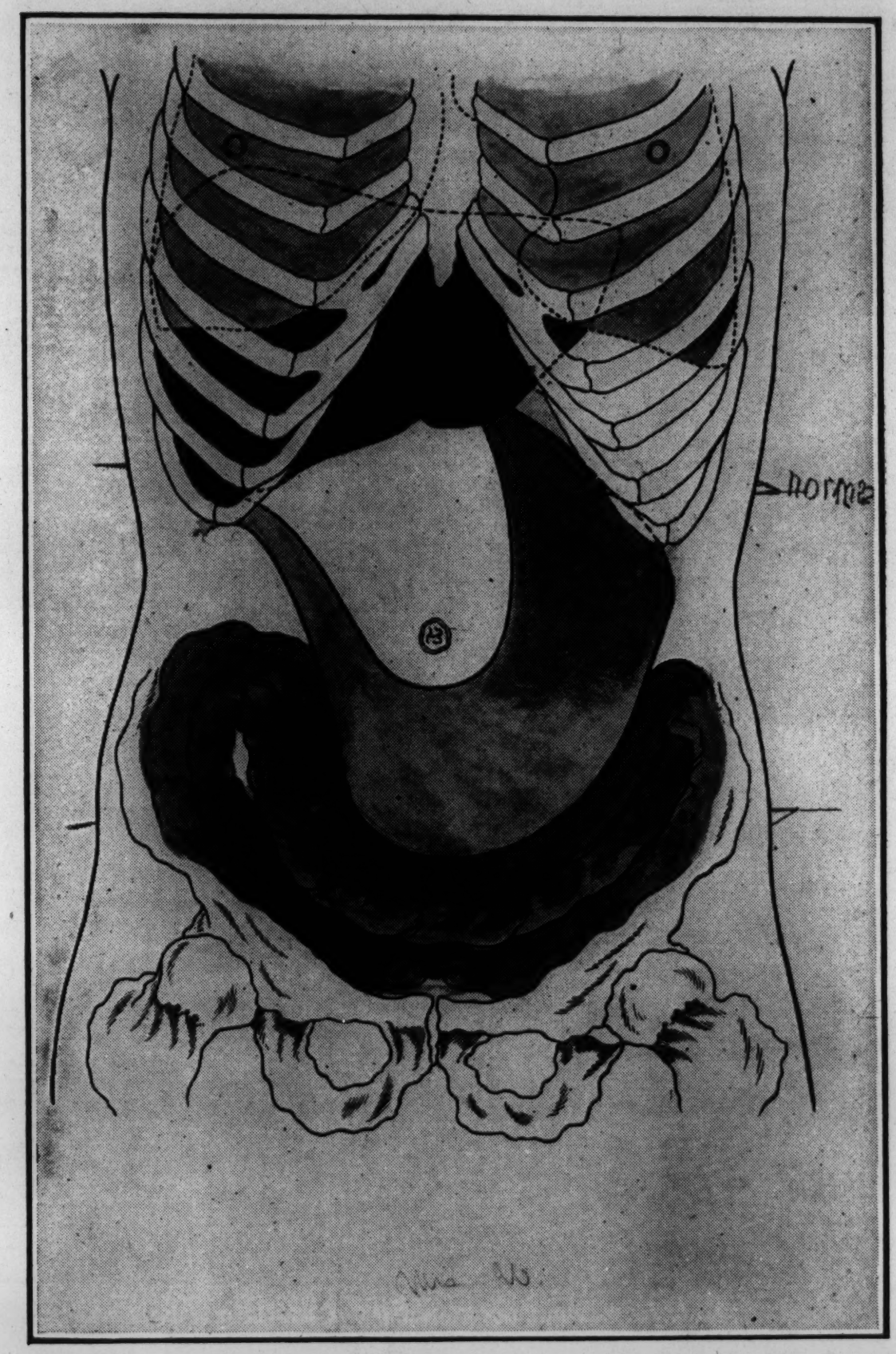


Fig. 8.—Case 1: Upper border of stomach below umbilicus.

then, the uterus might be displaced by the involvement of any one or all of three different structures. First, a general relaxation of the connective tissue supporting the peritoneum, being a part either of a general bodily

condition or of a local condition; second, it may be due to a stretching of the peritoneum, primarily allowing the uterus to sag, thus throwing the weight upon muscular ligaments which are not prepared for it and thus

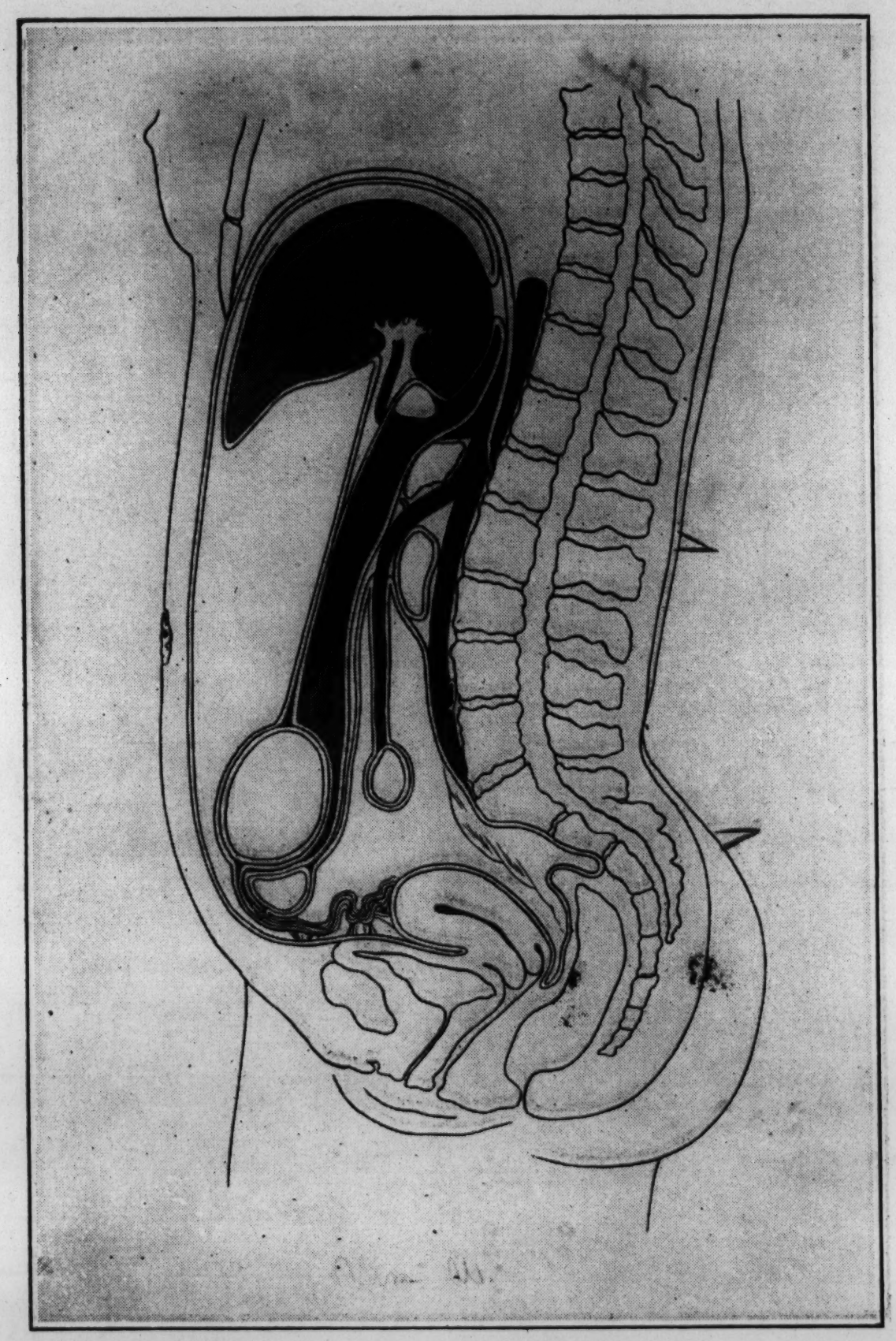


Fig. 9.—Sectional view of Case 1, showing omentum adhered tc pelvic wall and uterus.

cause them to give way; third, the destruction by traumatism or other means of the activity of the muscular ligaments, thus preventing them from the proper poising of the uterus and throwing a dead weight at abnormal angles upon the peritoneum.

If we admit that the peritoneum is the universal suspensory ligament, we are then to consider the best method of repairing its weaknesses. Two pieces of iron at white heat, brought together and hammered on an

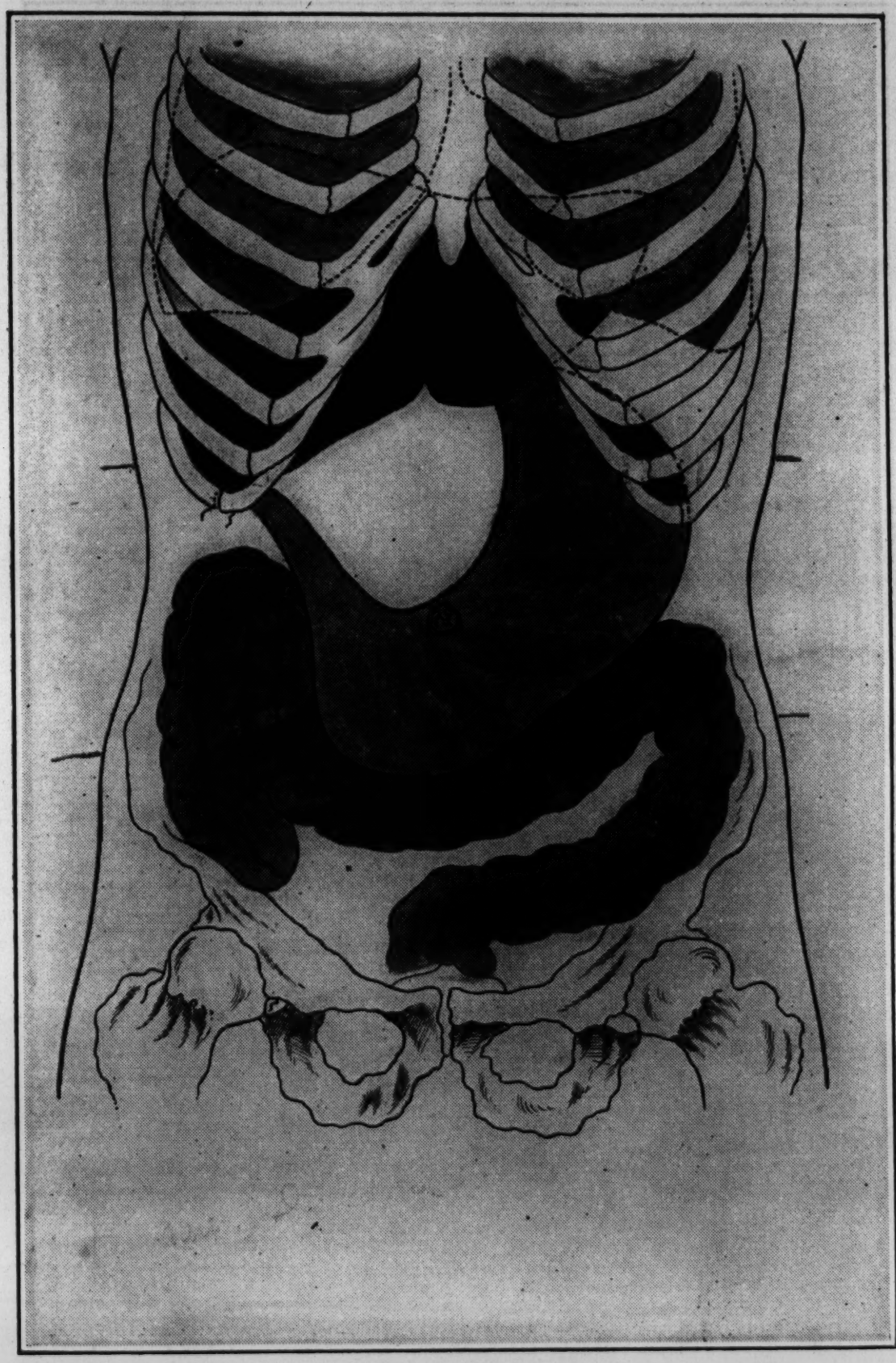


Fig. 10.—Case 2: Front view. Stomach below umbilicus. Appendix had been removed. Ascending and transverse colon grown together.

anvil, blend and form one piece. The two ends of a broken bone are surrounded by temporary or provisional callous which is soon infiltrated with bone cells, and the result is a soon and complete blending into one bone.

Two peritoneal surfaces brought together and held firmly in an aseptic state are first surrounded by an excessive temporary exudate which is absorbed in time, leaving the surfaces perfectly blended into one mem-

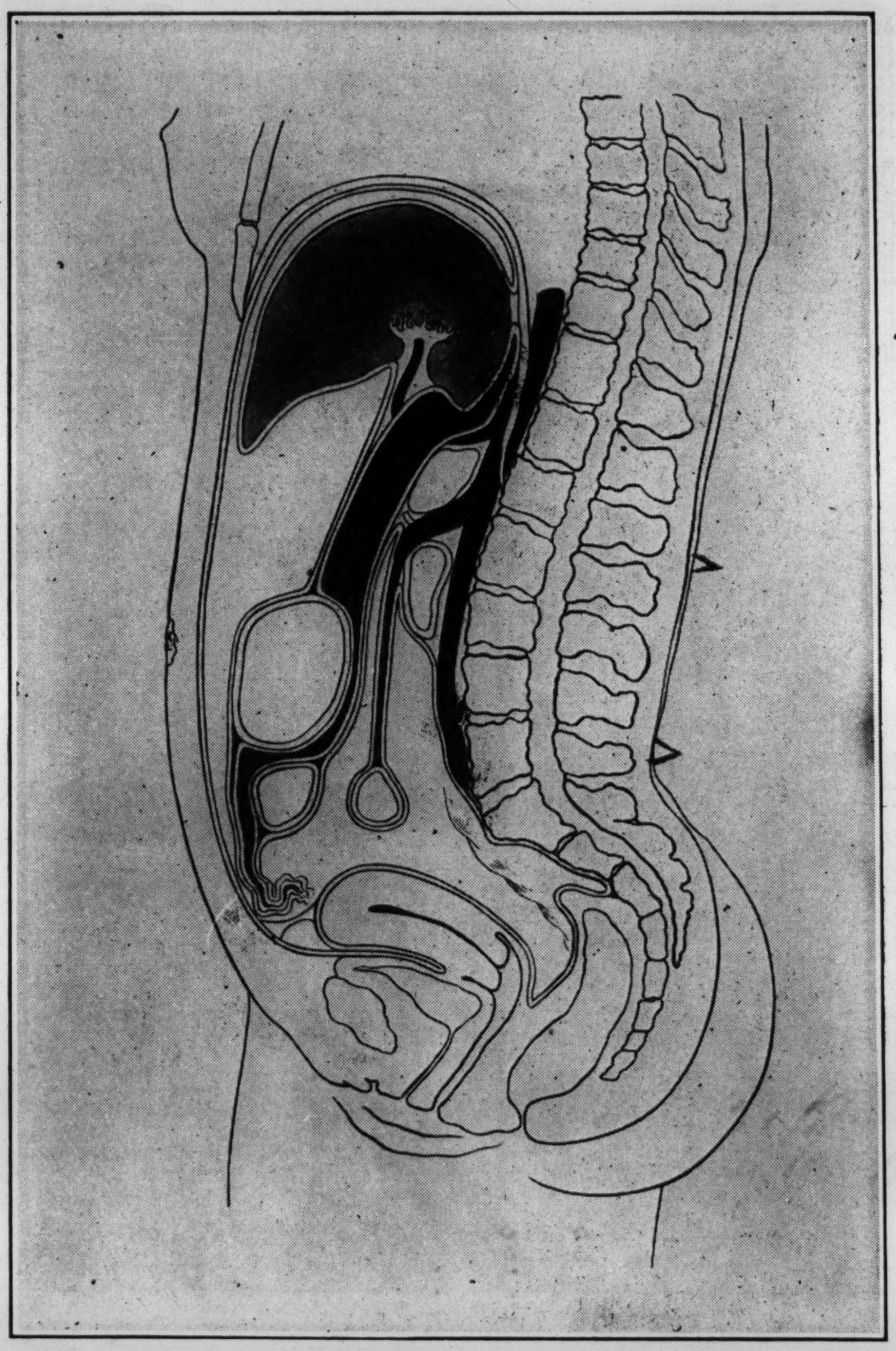


Fig. 11.—Sectional view of Case 2, showing position of stomach, ligament following ventro-suspension.

brane. This is demonstrated by the line of union following a Lembert suture in gastro-enterostomy or entero-enterostomy. If water or other agent is thrown upon the pieces of iron during the process of blending, they

simply stick together temporarily but do not form a perfect blending, being easily separated. Suppuration or other disturbance will frequently prevent the blending of the two ends of bone, forming a flail joint. This

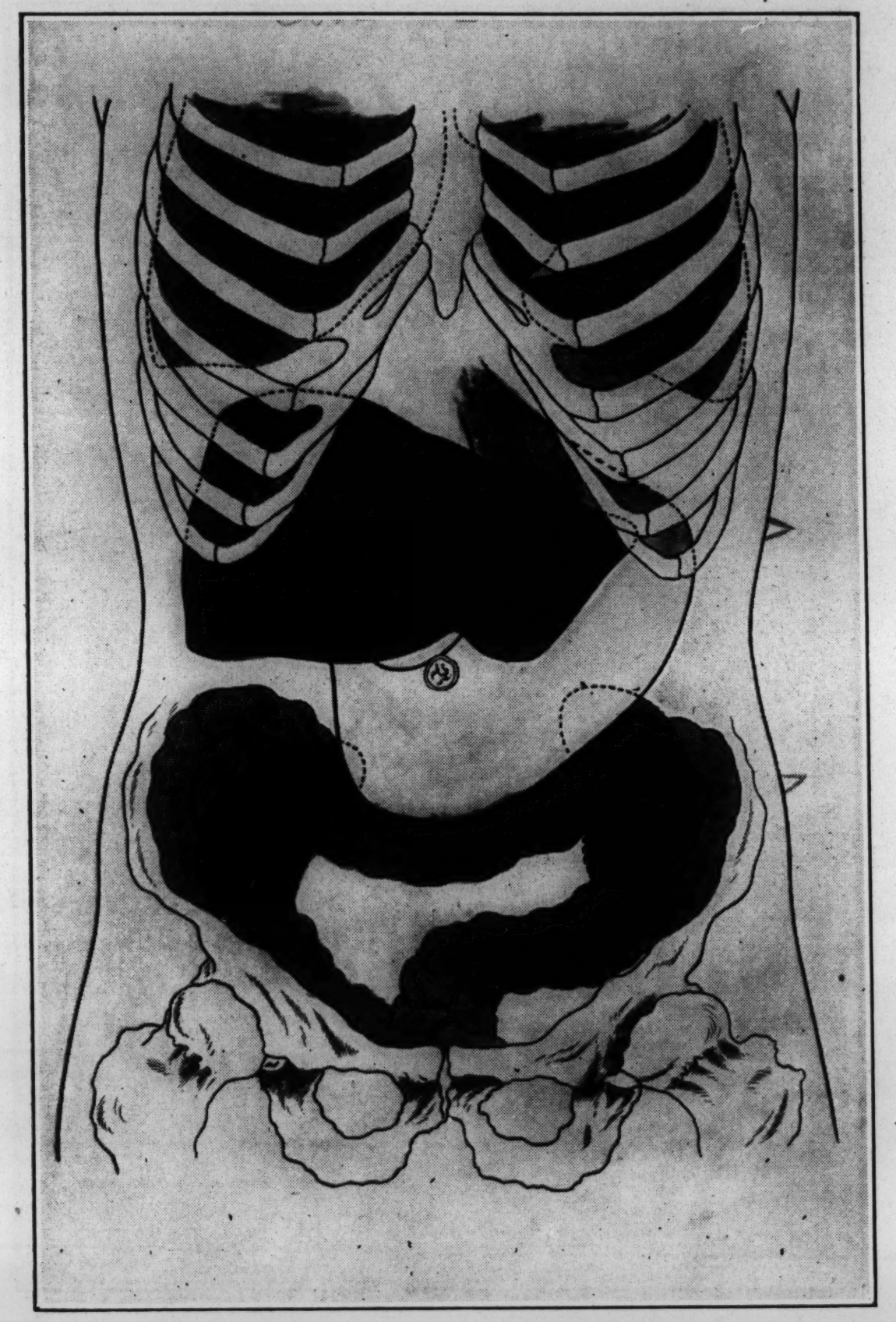


Fig. 12.—Case 3: Liver, stomach and both kidneys prolapsed.

fibrous union bears a close analogy to an adhesion. If suppuration takes place during the process of the union of peritoneal surfaces, blending does not take place. Adhesions form which are finally absorbed. It is prob-

able that there is no more effectual proof of the power of the peritoneum to hold weight than that shown in cases following ventro-suspension. Here the blending of two surfaces of peritoneum not more than a half inch

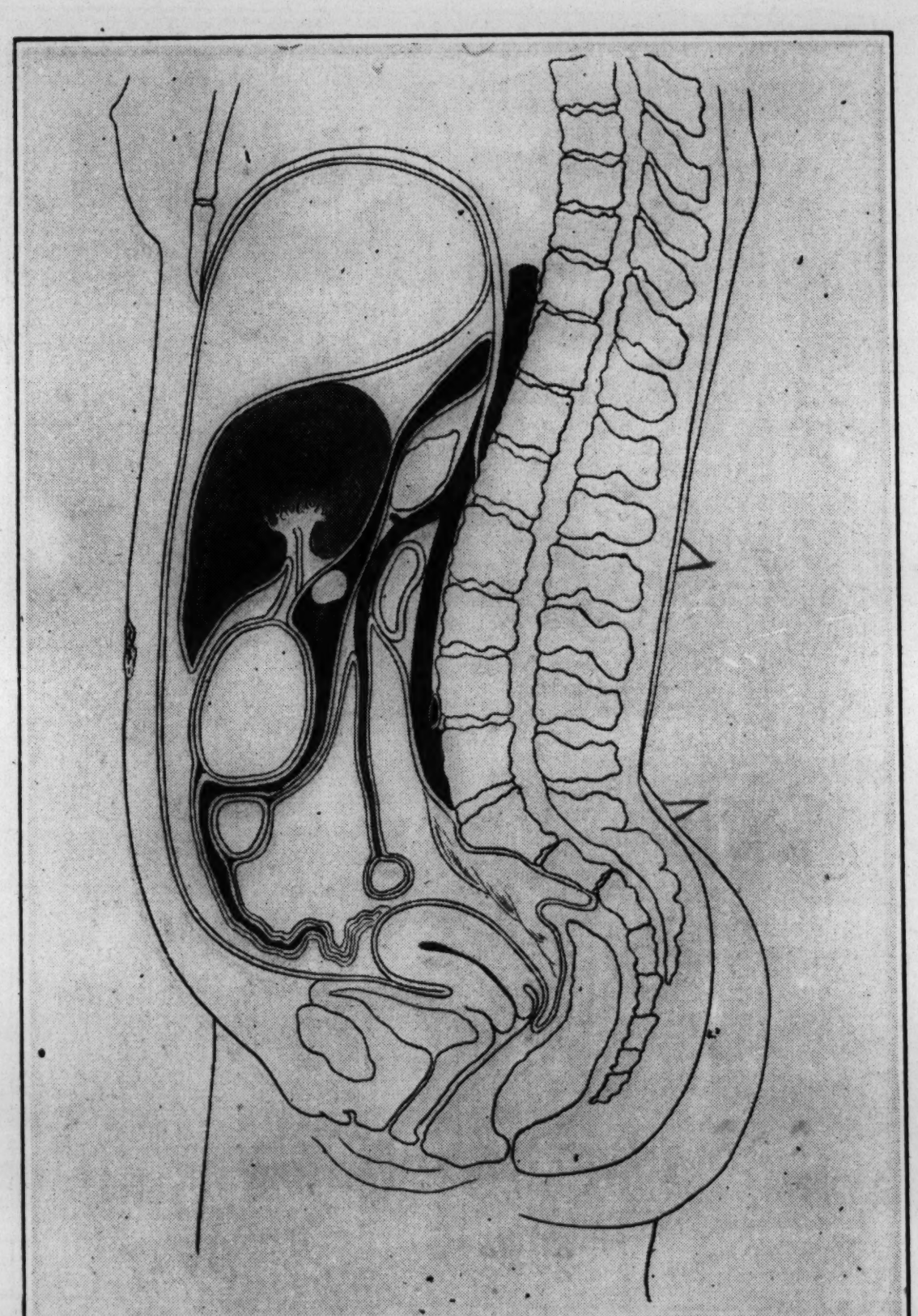


Fig. 13.—Sectional view of Case 3.

square and sometimes less forms a support which, in the great majority of cases, is sufficient to hold the uterus in place for all time to come. This ligament is not a fibrous band entirely, but is a stretching out of

the peritoneum to a certain extent, generally to a point which allows of normal relation. If a larger area of the uterus is attached to the abdominal wall, we frequently have a ventro-fixation. The blending of a

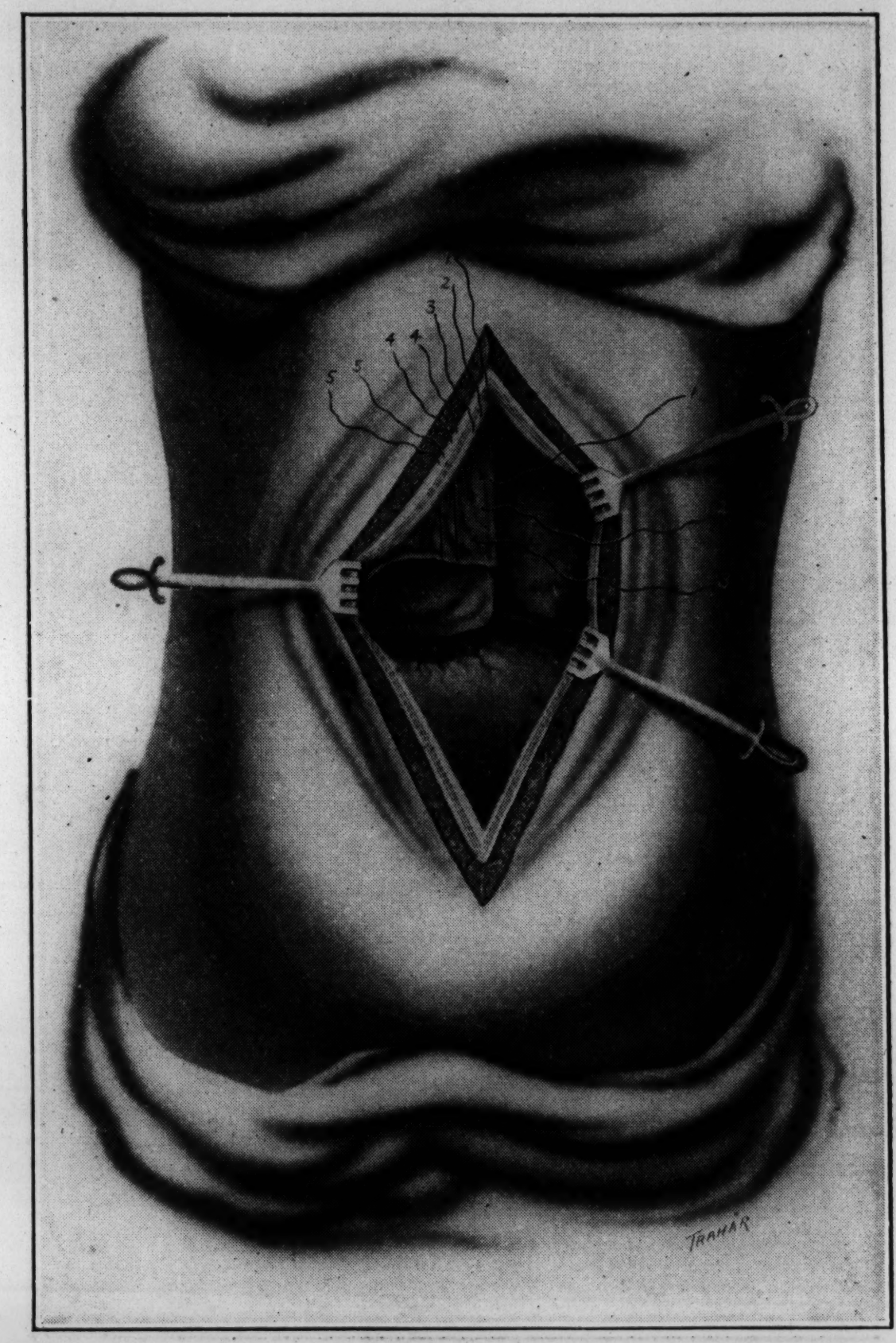


Fig. 14.—Shortening suspensory ligament of the liver. First step. Case 3.

space of peritoneum an inch square will generally produce a ventro-fixation. Two of my own cases had to be operated upon for this condition. Cases in which the uterus has returned to its normal position after a

blending has taken place show that the newly-formed ligament has been stretched out into a thread-like ligament but has not given away. Practically all those cases of failure of union in ventro-suspension have been

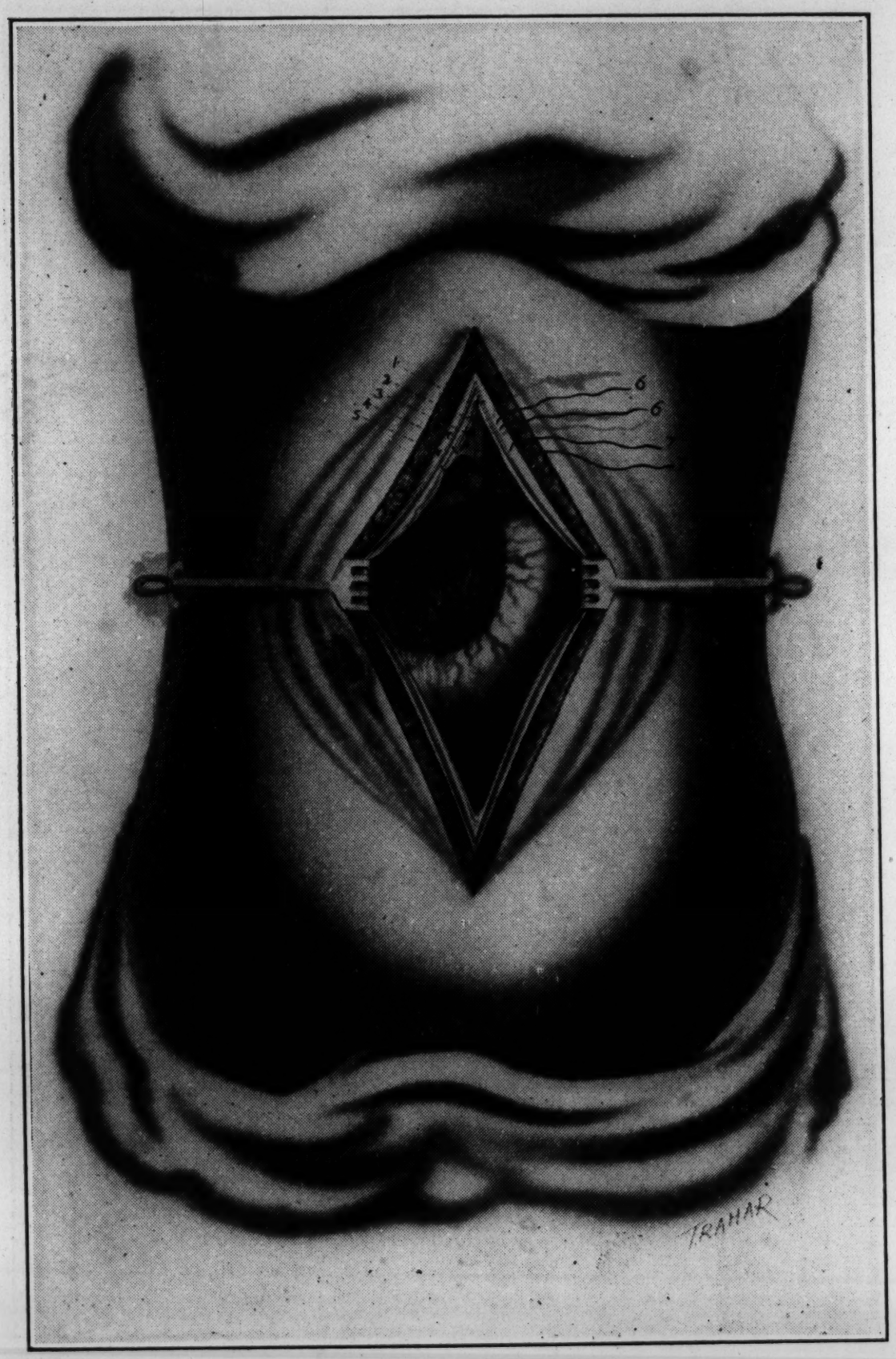


Fig. 15.—Passing additional suture through liver substance. Second step. Case 3.

due to suppuration either immediately following the operation or around the suspensory stitch some time after the operation. In these cases there was no blending, but adhesions. These adhesive ligaments are prac-

tically always absorbed. By suturing the livers and spleens of both dogs and hogs, I have been able to demonstrate that a perfect blending of peritoneum always takes place, and that a ligament is formed

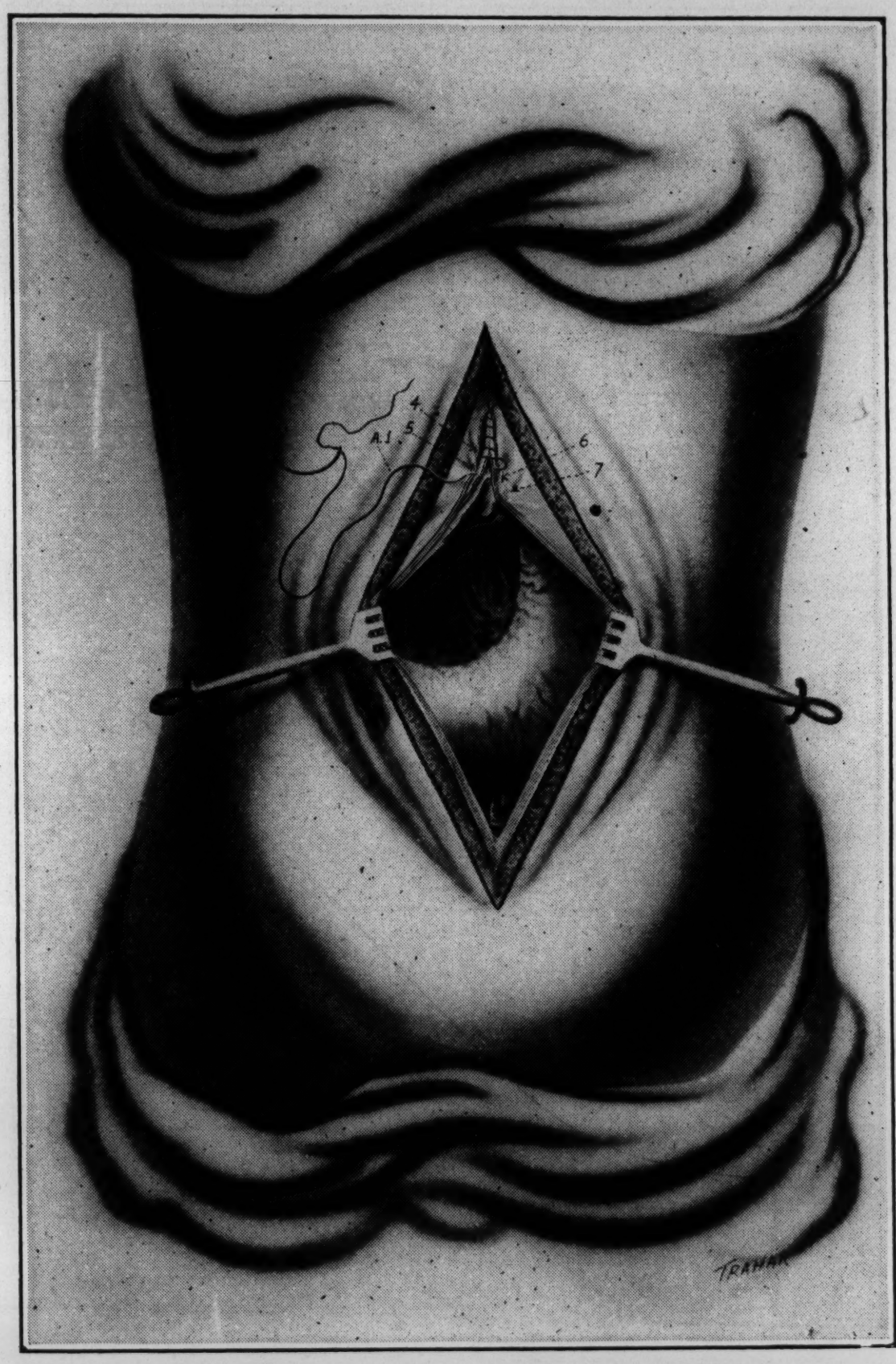


Fig. 16.—Ligament suspended. Peritoneum and fascia sutured as far as the edge of the liver. Third step. Case 3.

which is very similar to the normal and with ample strength.

Figure 2 shows a specimen from a pig's liver attached to the abdominal wall which had been sutured by two

large catgut quilt sutures passing entirely through the liver substance, six weeks before; line of union one by three inches, and would easily support the entire weight of the pig's liver. Line of union looks exactly like the

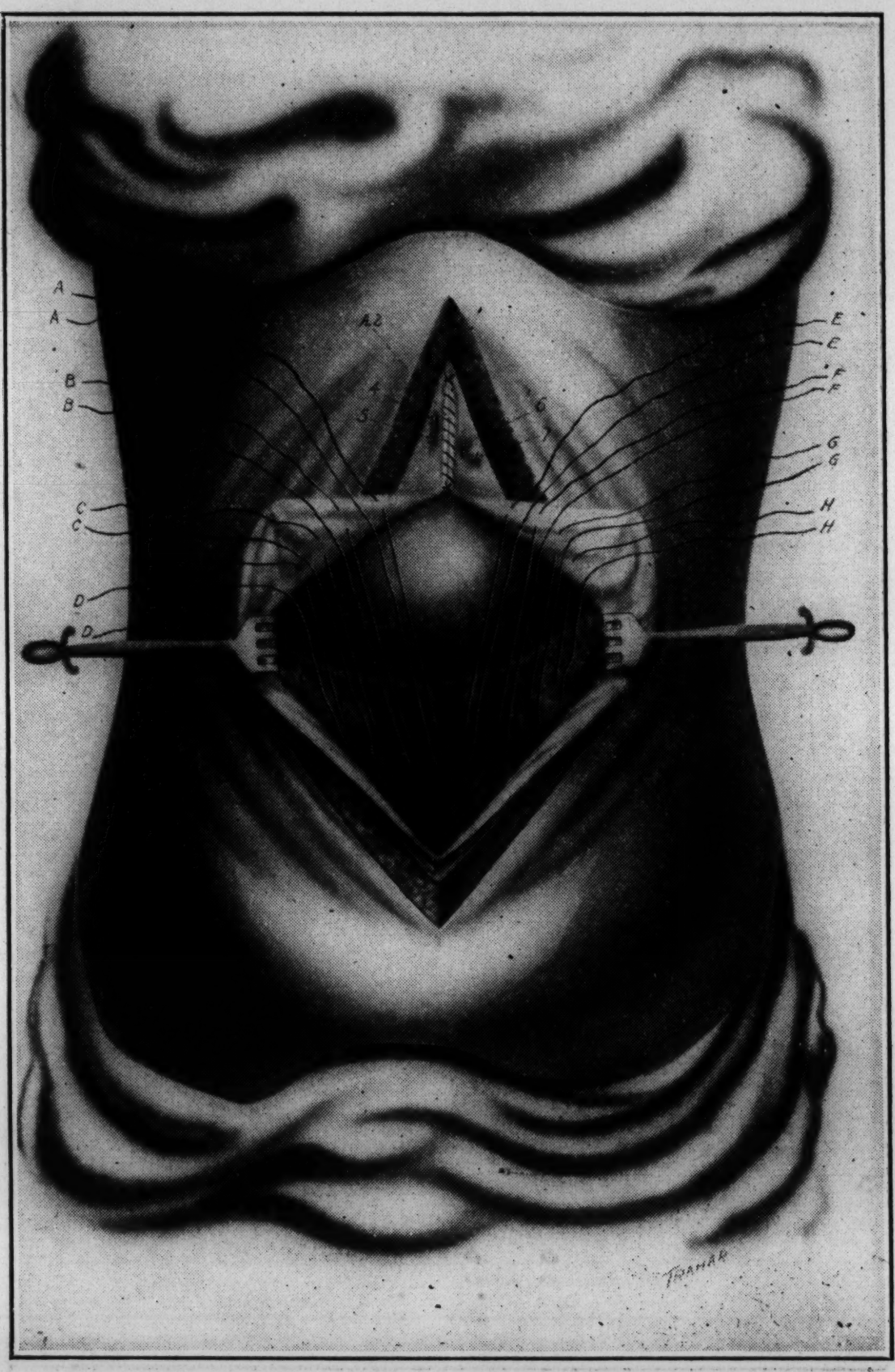


Fig. 17.—Suturing the omentum to peritoneum of abdominal wall, to produce a hammock for suspension of the stomach. Case 3.

merging of the normal suspensory ligament with the peritoneal coat of the liver.

Figure 3.—Omentum of pig sutured to the abdominal wall by catgut sutures, translucent at time of operation.

Six weeks after operation blending was perfect. Omentum at point of suture one-fourth of an inch thick and gradually thinning until it fades away about one and one-half inches from the stitches to its normal trans-

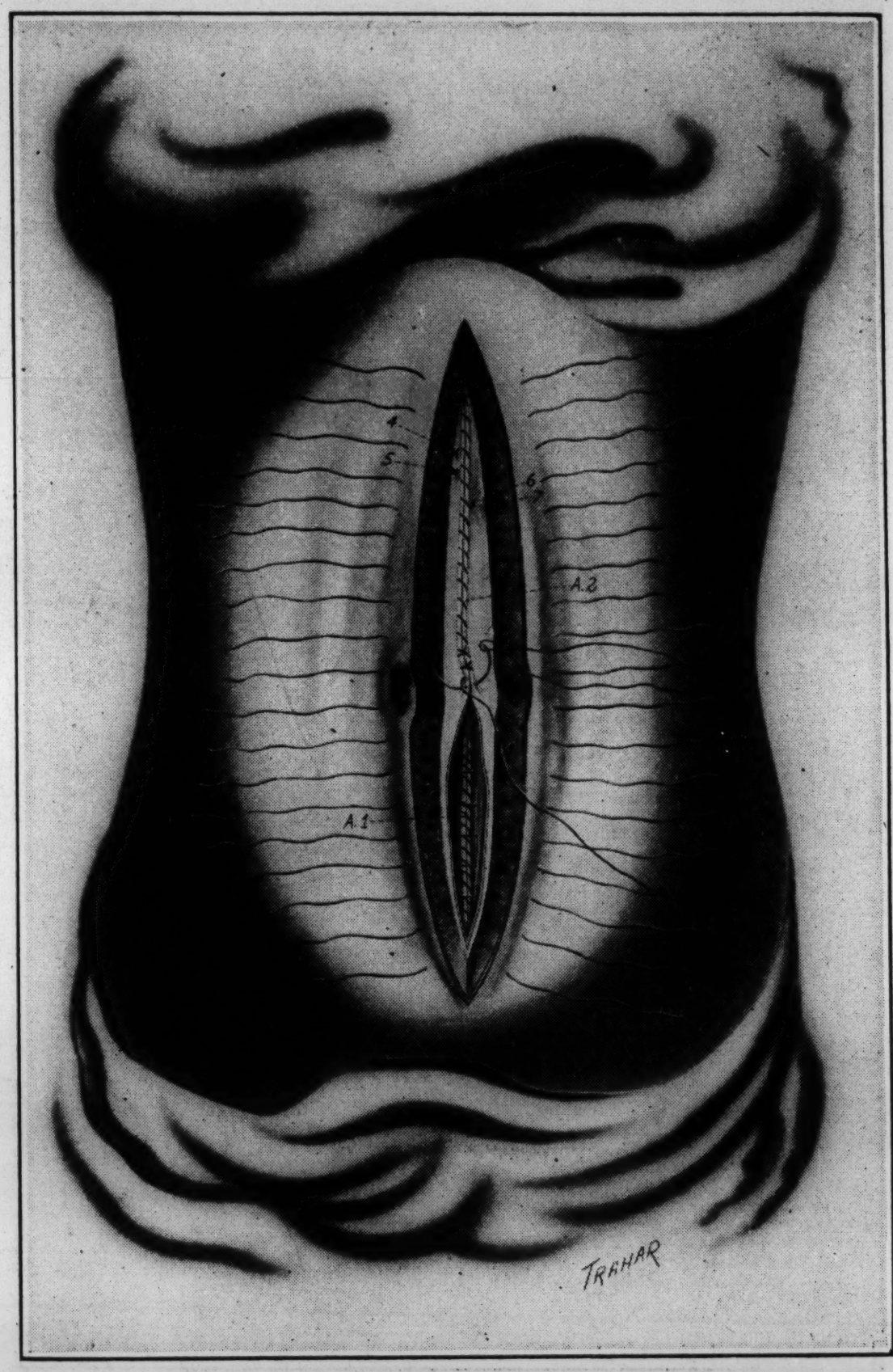


Fig. 18.—Closing the abdomen. 4, 5, 6, and 7 represent sutures passing through liver substance. A-1, suturing peritoneum. A-2, suturing fascia. Recti muscles on either side of A-1, inside split sheath. Case 3.

lucent state. The attachment would easily bear ten pounds' weight. The great thickness at the point of

suture appeared to be fat infiltrated with a temporary exudate.

Figure 4 shows the mesentery of a pig being shortened by placing sutures six inches apart parallel to the

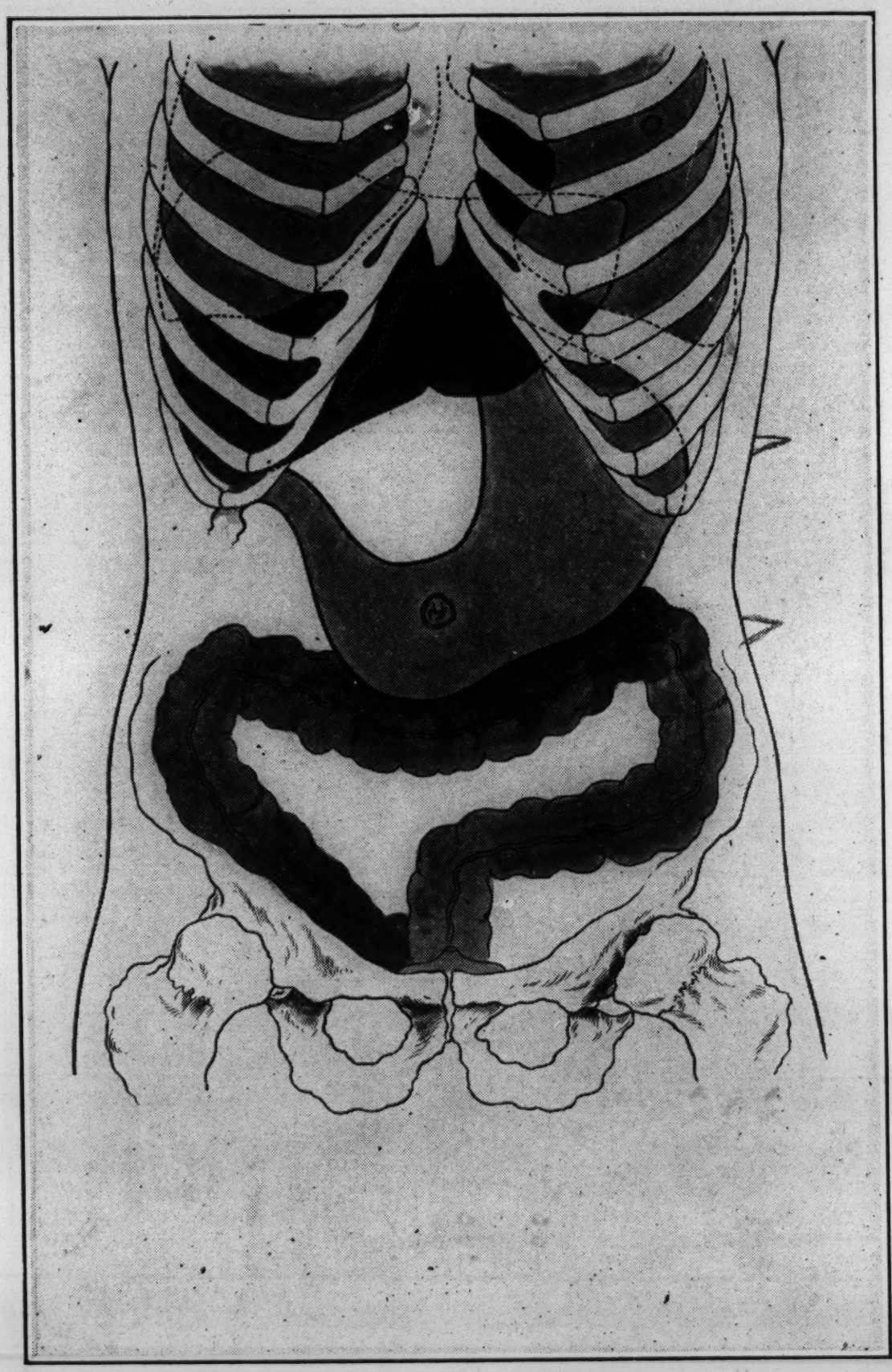


Fig. 19.—Case 4: Front view. Stomach only organ displaced.

mesenteric arteries. Figure 5 shows the result six weeks afterward. Mesentery is thickened from a translucent membrane to nearly one-fourth of an inch thick at and near the point of suture. Blending was per-

fect and union at this time so strong that three sutures would easily have carried the weight of the entire intestine. No elongation had taken place, notwithstanding the fact that the animals were at liberty the next day

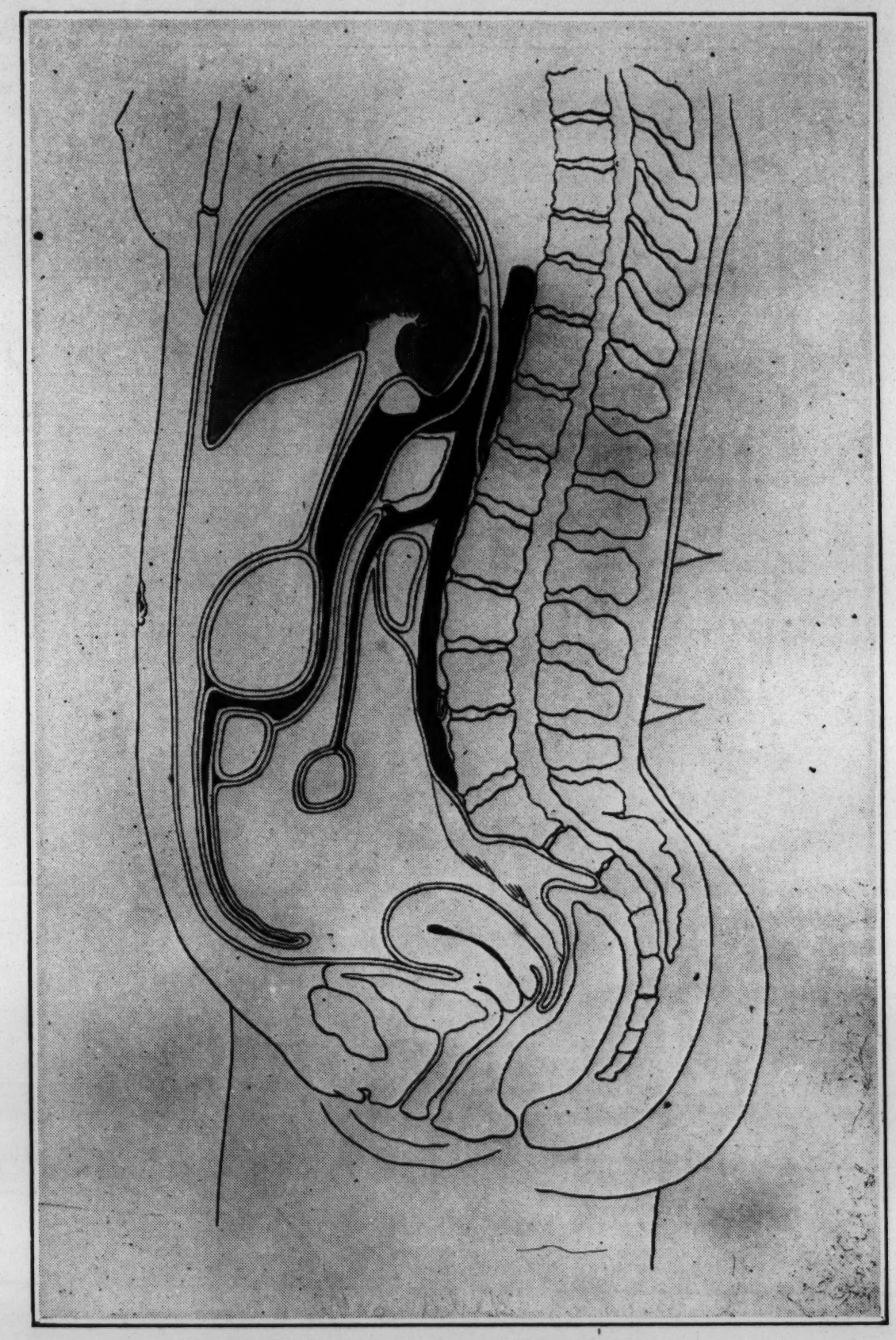


Fig. 20.—Sectional view Case 4.

after the operation. The reports of operations by Beyea's method of shortening the gastro-hepatic omentum further go to prove that this kind of shortening is effectual. Davis' operation of suturing the gastro-hepatic omentum to the abdominal wall has been successful.

I shall now relate my experience with purely abdominal ptosis, and will then illustrate the treatment I use for displacements of the uterus, and finally my conclusion from my present inaccurate knowledge of the sub-

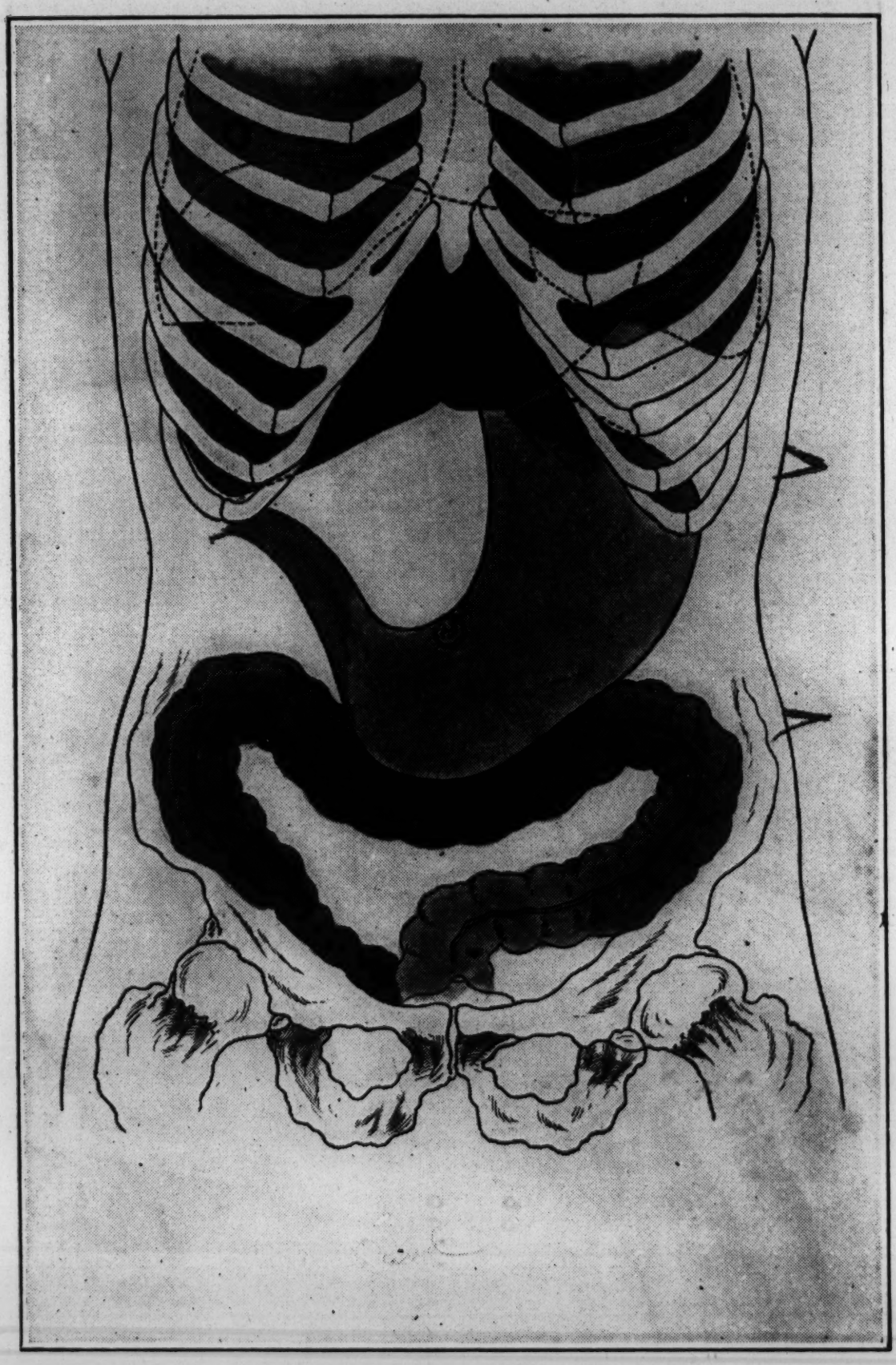


Fig. 21.—Front view Case 5.

ject. Every one of the cases reported of abdominal ptosis has been a case of complete invalidism in which every other known method had been tried. Therefore it was easy to gain the patient's consent as well as my

own, as there was but little to be lost by the more radical means of surgery.

CASE 1.—Age 42, been sick more or less for fifteen years, dating back to pelvic inflammation. Treated

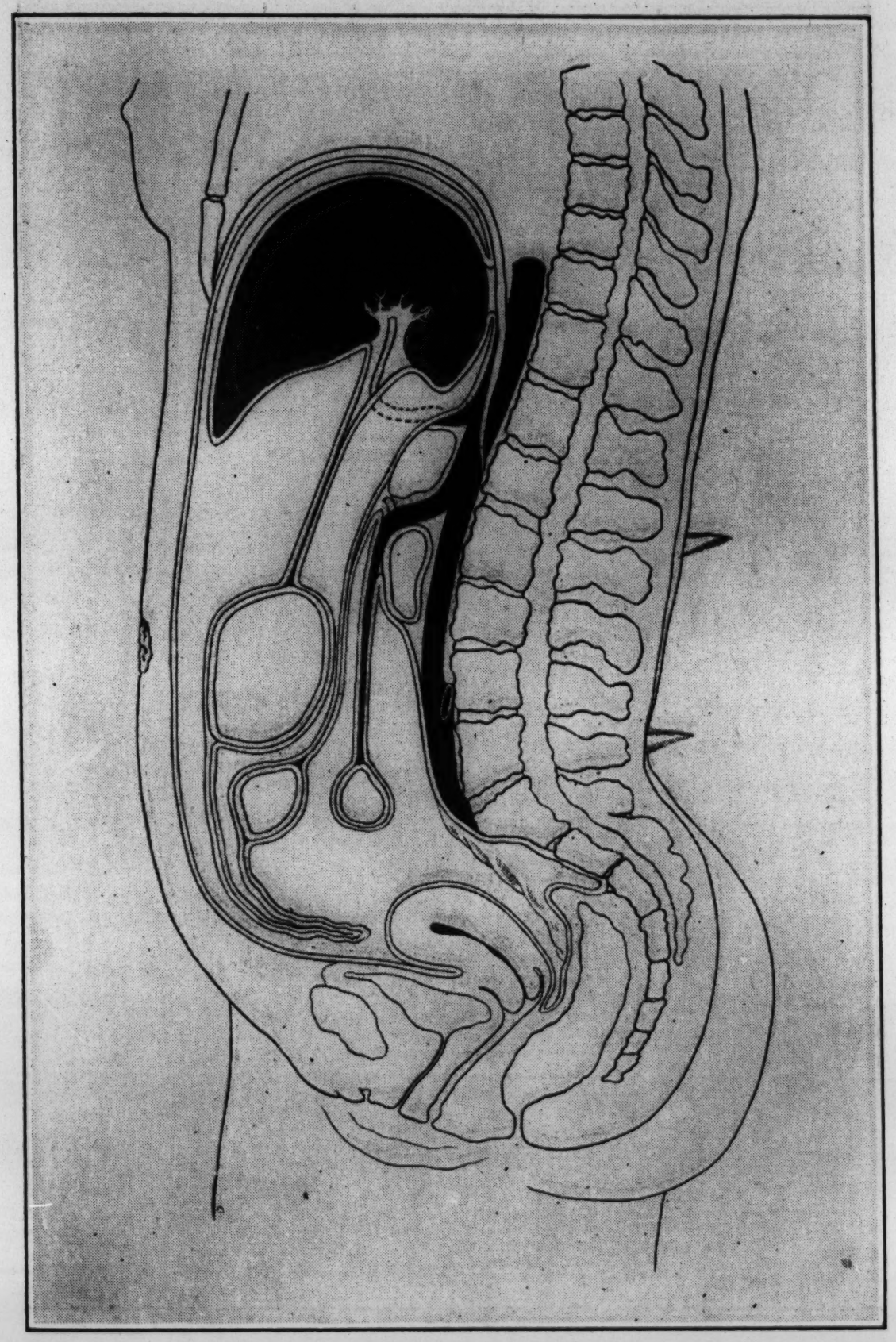


Fig. 22.—Sectional view of Case 5.

medically for chronic gastritis eleven months prior to operation. Had been constantly under the care of a doctor during this time, and had had the services of a trained nurse for six months previous to the operation.

Body weight reduced from one hundred and fifty to less than one hundred; great distress on taking food into the stomach, no matter how simple; pain extending up the esophagus. At operation, stomach found

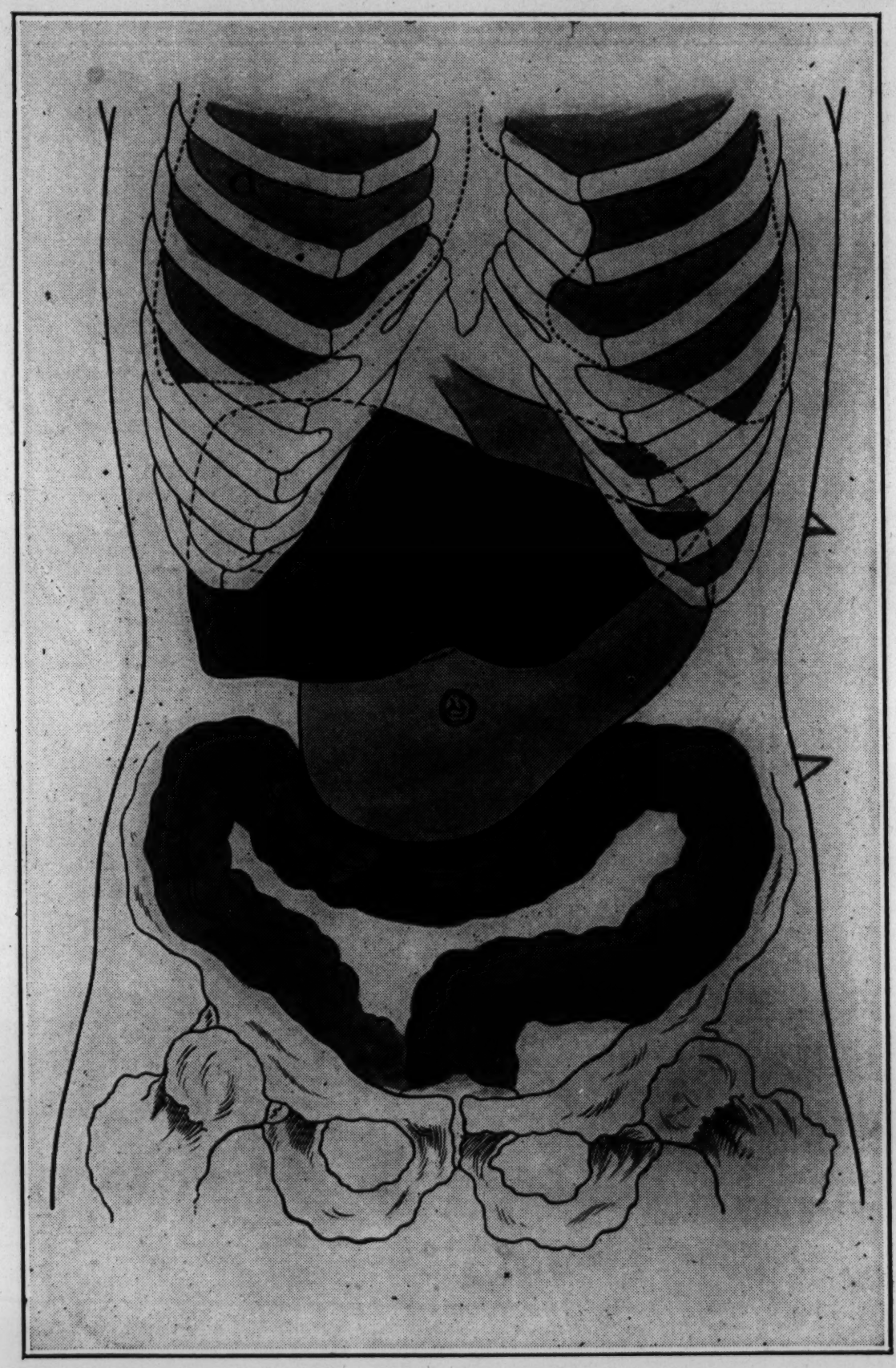


Fig. 23.—Front view Case 6, liver and stomach displaced.

with upper border an inch below umbilicus, (Figs. 8 and 9); omentum adherent to front wall of pelvis firmly making a complete tent; right ovary prolapsed and adherent in the cul-de-sac; all other organs normal; no diastasis recti.

Operation, November, 1901. Dissected adhesions from anterior pelvic wall, removed cystic portion of the ovary, stitched omentum to abdominal wall by three chromicized catgut sutures. Pain relieved immediately

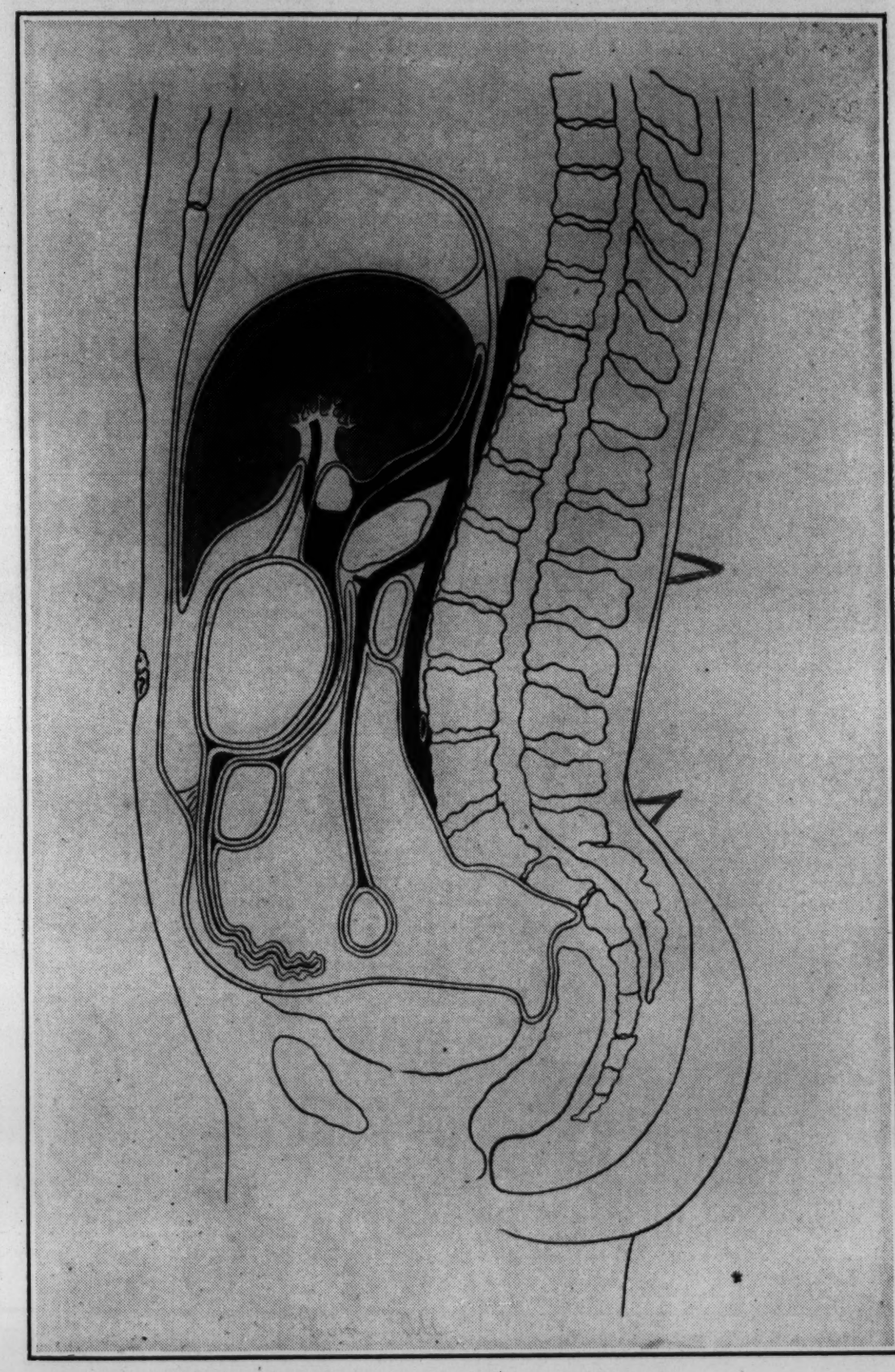


Fig. 24.—Sectional view of Case 6. Showing decided stricture of abdominal wall. Union of omentum to abdominal wall; displacement of stomach and liver.

after operation, able to digest light food four days afterwards, eating full meals with comfort eight weeks afterwards. Present health good, eats all kinds of foods

without disturbance. Recent examination shows stomach in position.

Case 2.—Female, age 34, operated for recurrent appendicitis, October, 1901, through a central incision,

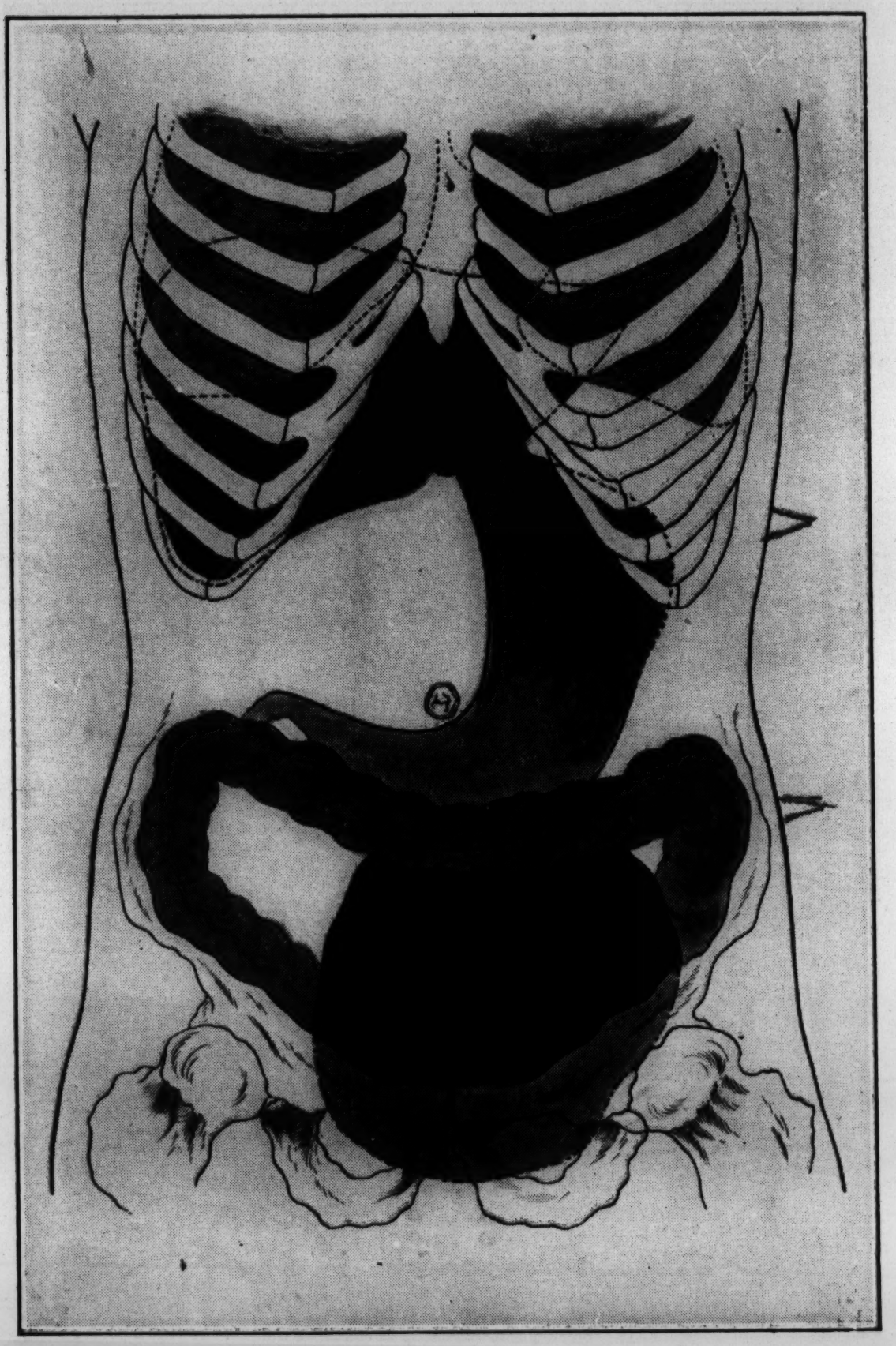


Fig. 25.—Front view of Case 7, showing displacement of stomach, due to gravitation of pancreatic tumor.

and ventro-suspension performed at the same time. Patient recovered from operation but was very little improved; practically impossible to get free movement of the bowels; frequent headaches and dyspeptic symp-

toms. Diagnosis, neurasthenia, treated by internist for a few months without results. At patient's request, abdomen was opened August, 1902. Transverse colon adherent to cecum and ascending colon, strong adhesions

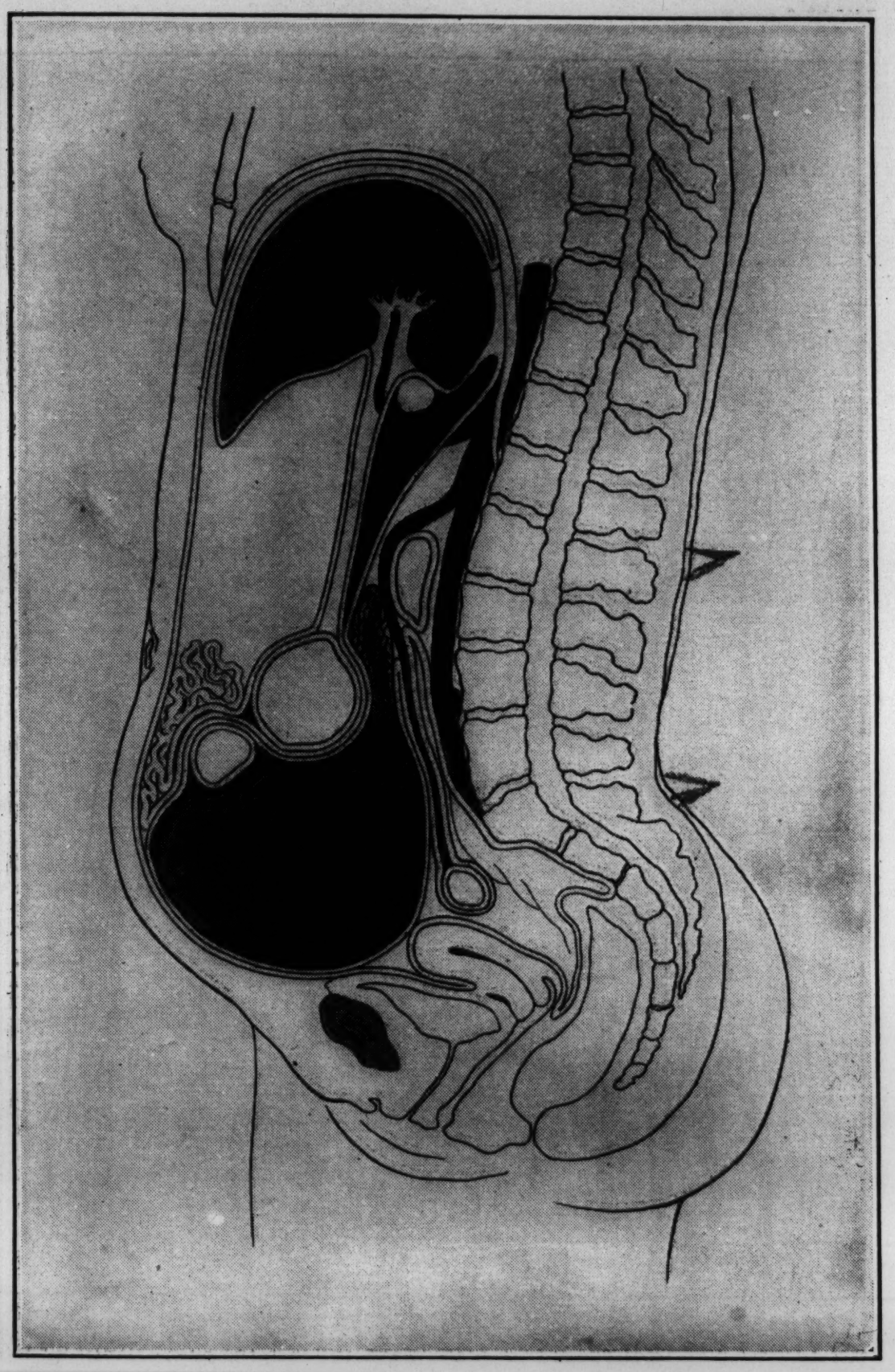


Fig. 26.—Sectional view of Case 7.

requiring scissors to separate them, stomach held down by attachment of omentum into the same mass with the upper border just below the umbilicus (Figs. 10 and 11). Adhesions separated, raw surfaces covered, omen-

tum stitched to the abdominal wall by chromicized catgut, and patient made an uninterrupted recovery. When last seen, eighteen months after operation, stomach was in normal condition, and patient was in good health.

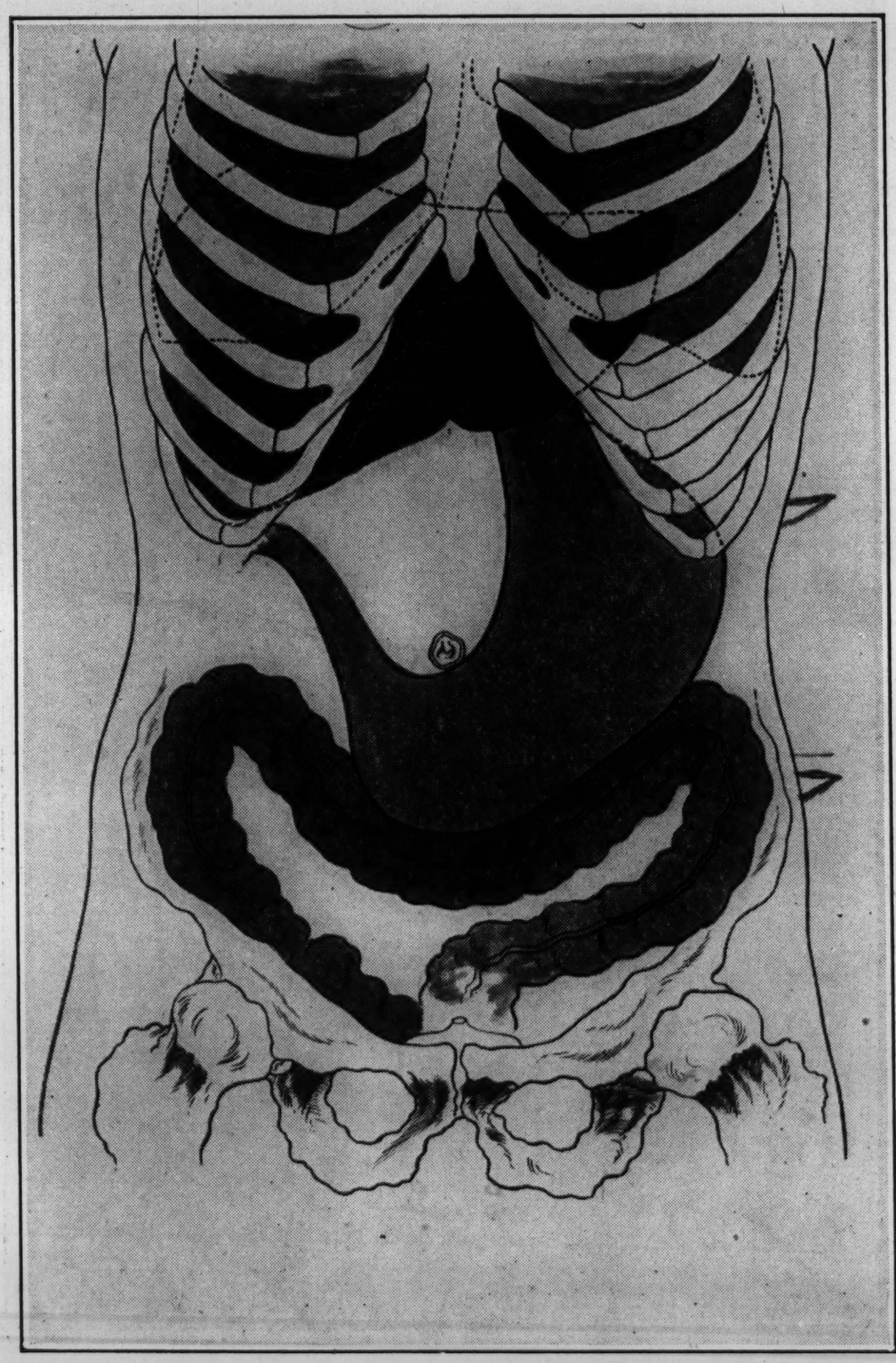


Fig. 27.—Front view of Case 8.

CASE 3.—Patient of Dr. Edna Timms. Operation Dec. 9, 1902. Age 32, mother of one child, had been treated as a neurasthenic five years, had gait similar to locomotor ataxia, entire absence of patellar reflexes, light-

ning pains in legs, had been confined to bed five months prior to operation, unable to eat ordinary diet, vomiting frequently, and putting in a miserable existence generally. Examination revealed diastasis recti, two

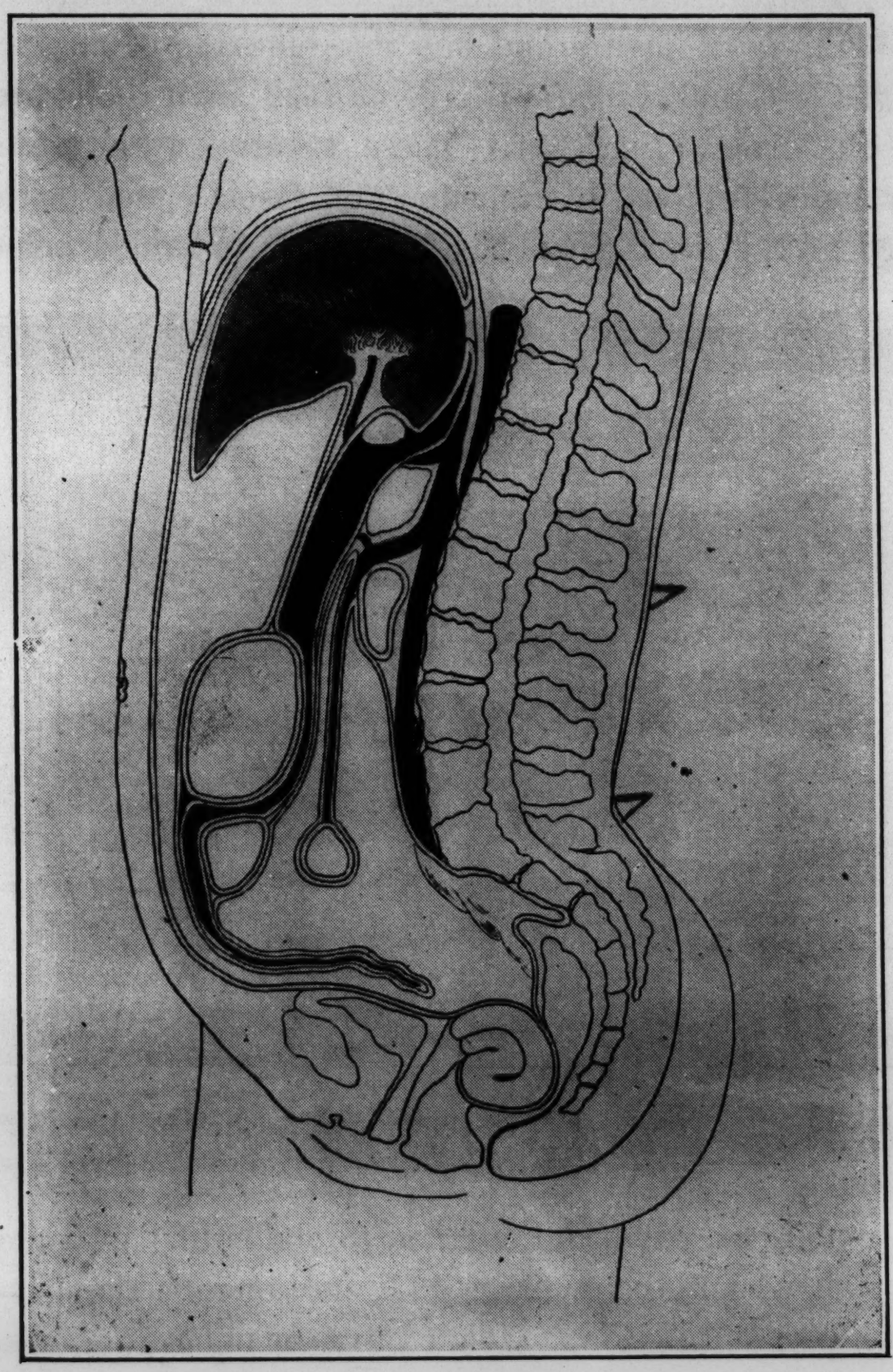


Fig. 28.—Sectional view of Case 8.

floating kidneys, prolapse of stomach and colon, and prolapse of liver (Figs. 12 and 13).

Operation.—Anchored both kidneys from the back by Davis' method, opened the abdomen, beginning at the

ensiform cartilage, anchored the liver by putting five sutures through the suspensory ligament (Fig. 14), two of which passed through the abdominal fascia. Finding that the left lobe of the liver still swung too low, a suture was passed through the liver substance at the transverse fissure and one three-fourths of an inch to the left, and three-fourths of an inch from the border of the liver (Fig. 15). These sutures were .passed through the fascia, peritoneum, and fascia closed to the edge of the liver (Fig. 16). Incision extended below

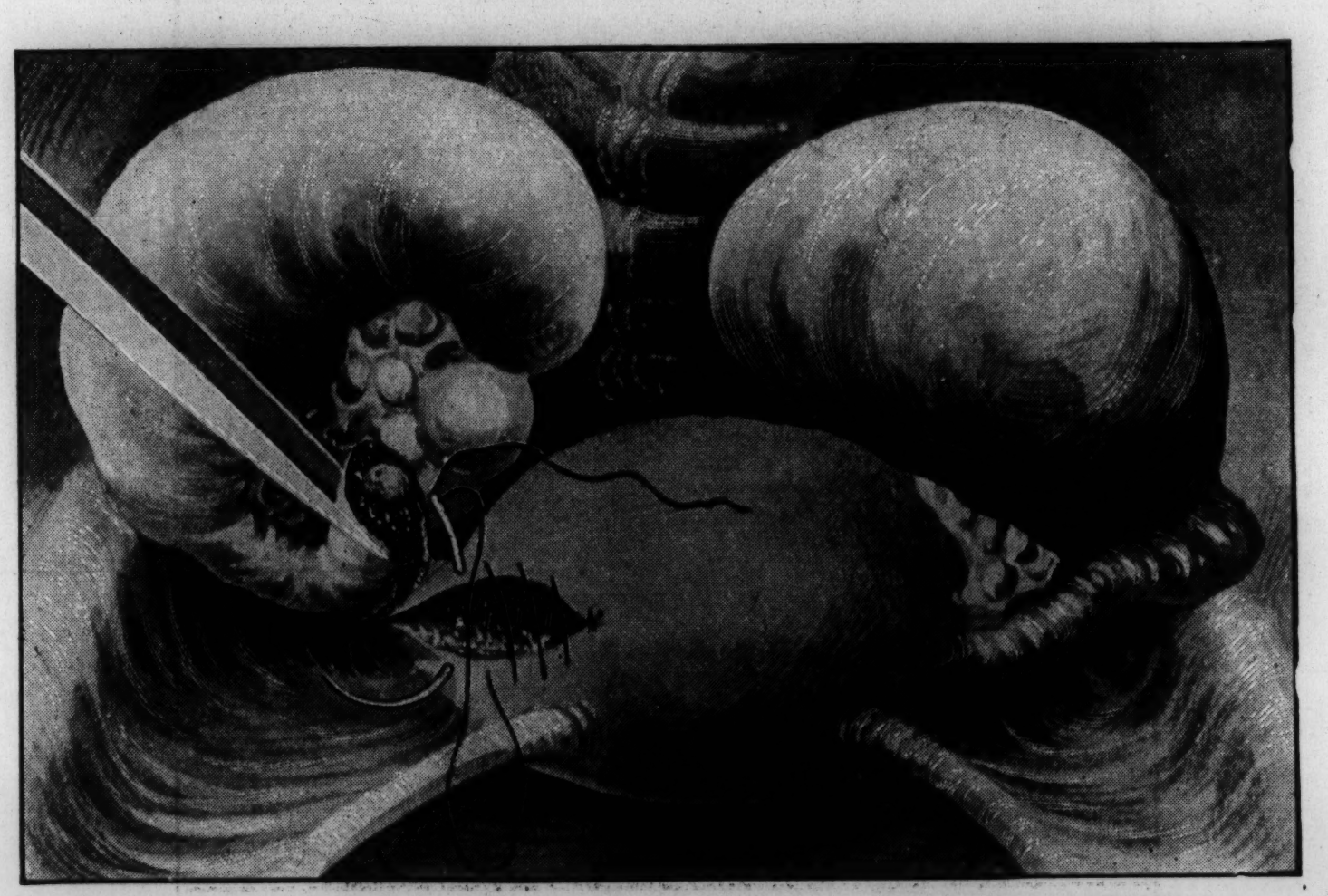


Fig. 29.—Excising a tube for pyosalpinx. (October *Annals of Surgery*, 1903.)

the umbilicus, omentum stitched to abdominal wall one inch above umbilicus (Fig. 17), peritoneum closed to umbilicus, and incision extended to near pubes. Appendix containing a concretion was removed, and one catgut suture taken in the meso-cecum to prevent its prolapsing into the pelvis; sheaths of the recti muscles split from the umbilicus down—posterior layer of the fascia and peritoneum sutured by continuing the peritoneal suture from above—rectus muscle brought together by

interrupted catgut sutures, fascia by continuous catgut; the entire length of the incision was reinforced by silk-worm gut sutures passing through skin, fascia and muscle (Fig. 18). We were unable to lift the stomach as high as its normal position, but its lower margin was above the umbilicus. Patient left hospital in about six weeks, had three or four attacks of stomach disturbance lasting only a day or two during the first six months after she left the hospital, pains in legs gradually lessened and finally disappeared, but ataxic gait remained.



Fig. 30.—Suturing mesosalpinx to side and back of uterus. (October *Annals of Surgery*, 1903.)

Has grown no worse, and has actually improved a little, probably due to improving general health; no return of reflexes. The stomach has not descended from its original point of attachment, and other organs have remained in place. Patient is in first-rate health, and has not required the services of a physician for more than a year.

Case 4.—Age 26, had no children, presented ordinary symptoms of nervous dyspepsia, had been treated

by many physicians with no benefit. At operation stomach found with upper margin about the umbilicus (Figs. 19 and 20), slight dilatation, no other displacements. Omentum was attached to abdominal wall (Fig. 17). Secondary hemorrhage into abdominal wound, probably coming from omentum one week after operation. Wound laid open and allowed to heal by granulation. Patient recovered slowly, but at end of a year was much improved. Was not a typical case for the operation.

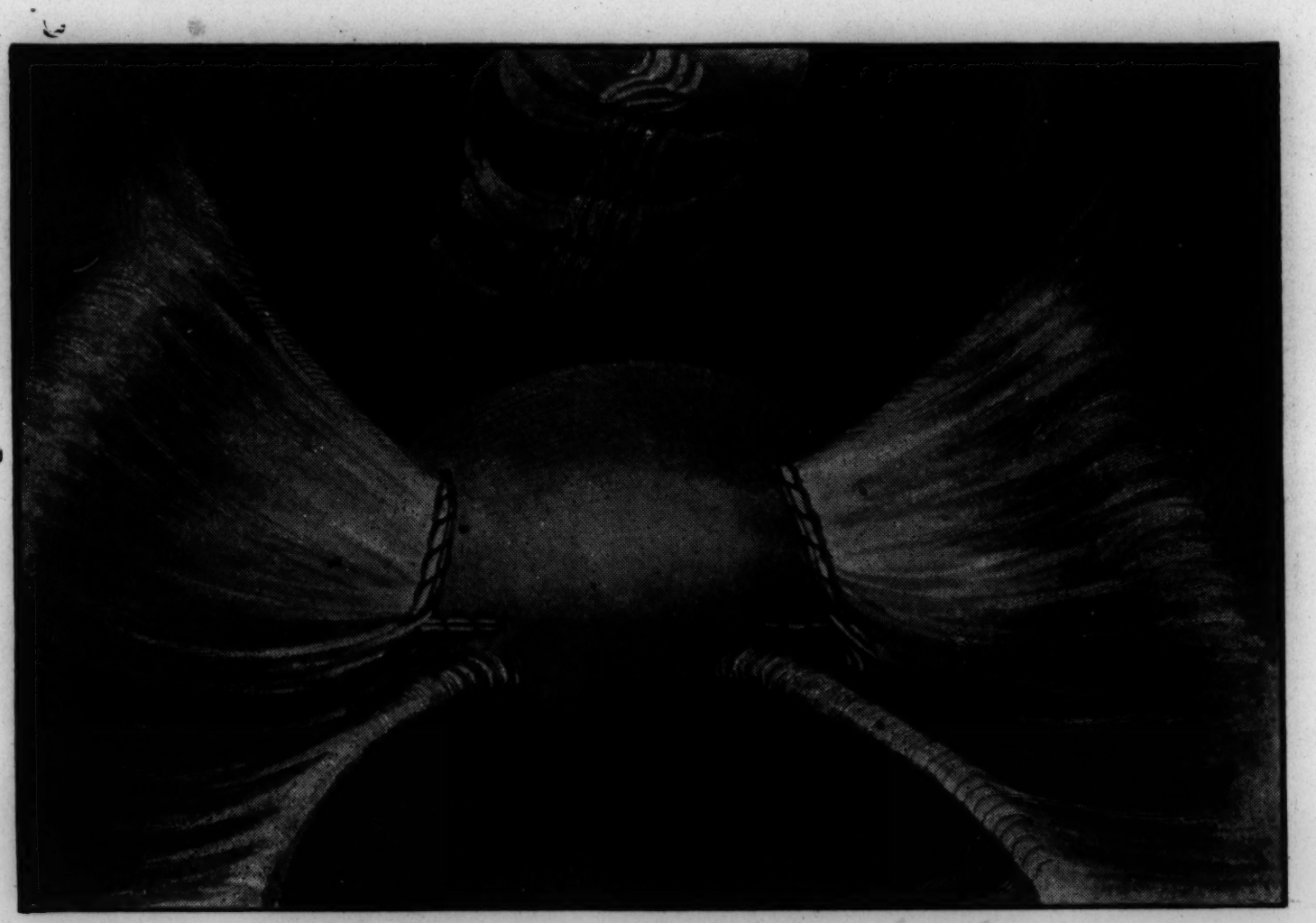


Fig. 31.—Broad ligament stitched to side of uterus. (October *Annals of Surgery*, 1903.)

CASE 5.—Patient of Dr. J. J. Selwood. Age 32, presenting general symptoms of nervous dyspepsia, dilatation and prolapse of stomach (Figs. 21 and 22), diastasis recti, and prolapsed and retroflexed uterus; other organs in normal position. Operation April, 1902. Omentum attached to the abdominal wall (Fig. 17), uterus replaced and round and broad ligaments advanced as will be shown later; sheaths of recti muscles split, and muscles brought together as before.

Recovery slow on account of thrombosis in left femoral vein, otherwise uninterrupted. After-results: Uterine symptoms relieved entirely, stomach and bowel symptoms remaining the same, notwithstanding the fact that the stomach was in normal position. Patient probably had gastric or duodenal ulcer and should have had gastro-enterostomy instead of suspension of stomach.

Case 6.—Patient of Dr. Baker, of Everett, Washington. Male, 51 years of age, sent to me for operation for gastroptosis. (Figs. 23 and 24.) Finding he

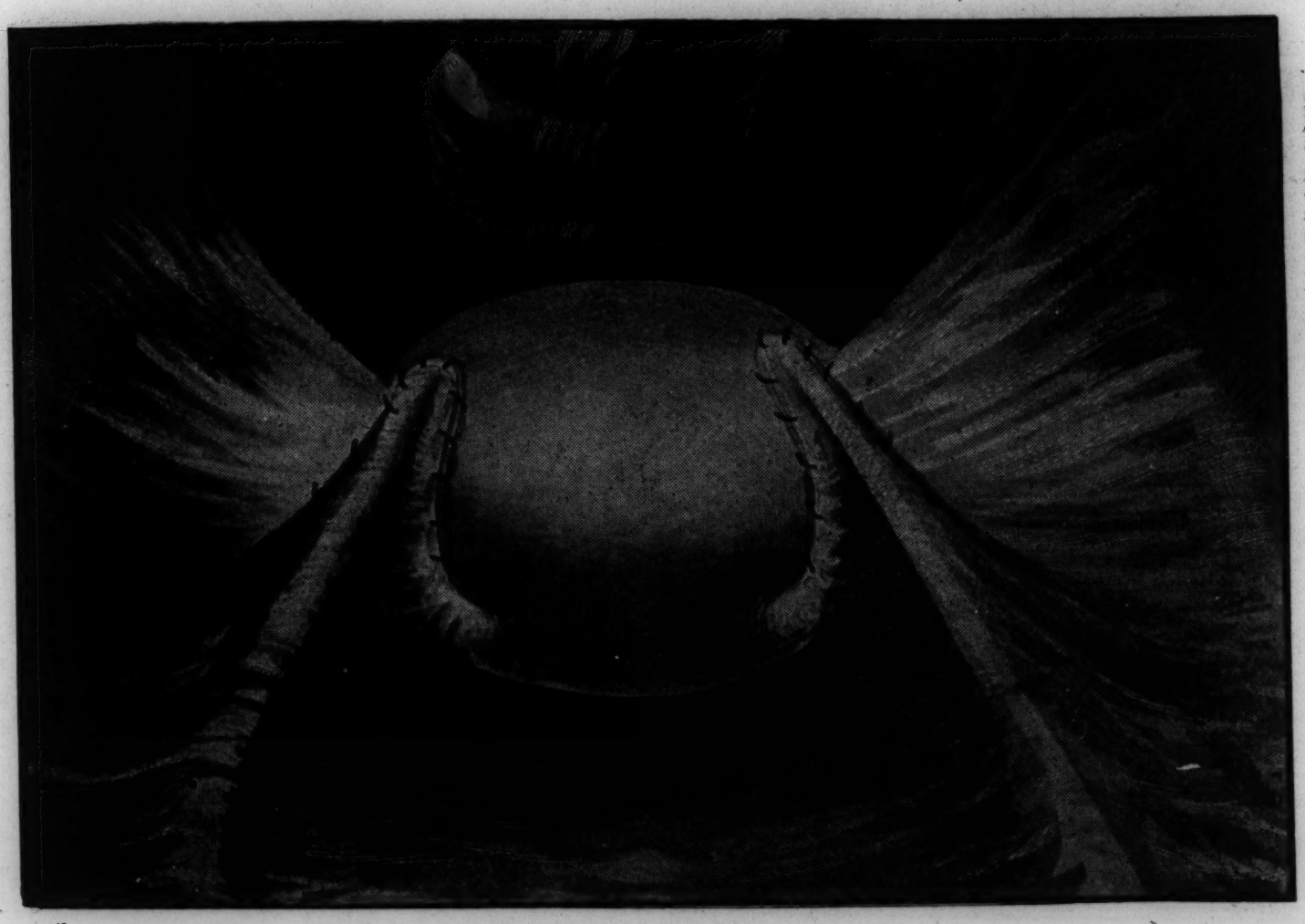


Fig. 32.—Posterior advancement of round and broad ligament. (October *Annals of Surgery,* 1903.)

had advancing paraplegia, referred him to a neurologist, and advised against operation. Neurologist offered him but little hope, and recommended that he come back and have me do the stomach operation; though he would live more comfortably while he lived. Operation, November, 1903. Most striking feature of the case was a stricture in the abdominal wall about two inches below the umbilicus, very much constricting the size of the abdominal cavity, omentum adherent very

firmly to this, stomach drawn down till upper margin was just above the umbilicus. Omentum sutured to the abdominal wall (Fig. 17). Patient made an uninterrupted recovery from the operation, went home after four weeks with the paraplegia still advancing, but his stomach improved. I saw his physician in July, 1904, and found that while the patient's paraplegia had continued, his digestion had been restored and he had greatly increased in flesh. A letter Jan. 5, 1905, says that digestion is perfect, but paralysis is gradually spreading upwards.

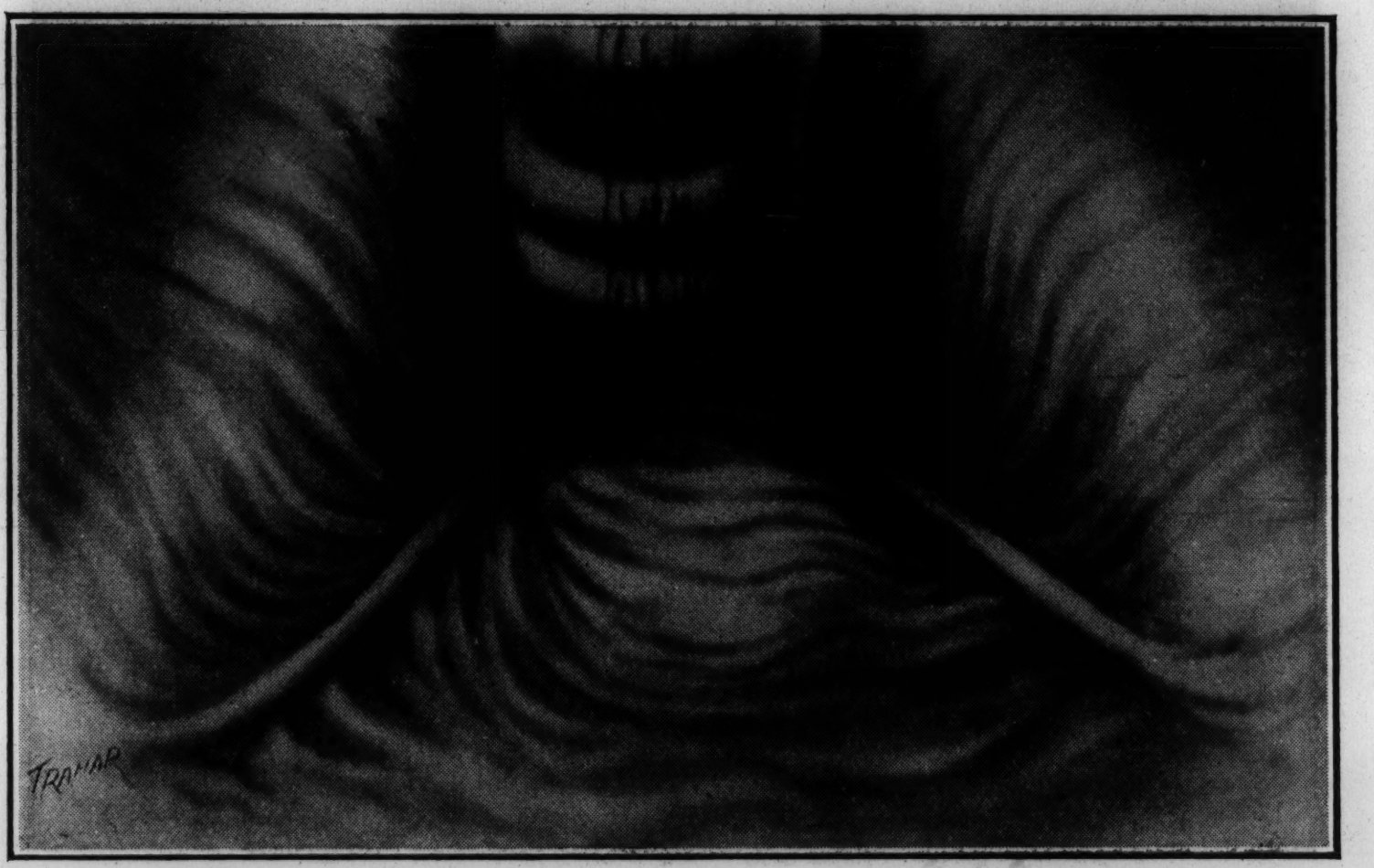


Fig. 33.—Retroflexion of the uterus. Seen from abdominal incision. Fundus entirely in the cul-de-sac, out of sight.

CASE 7.—Patient of Dr. Leo Ricen. Patient about 64. Diagnosis of ovarian cyst had been repeatedly made by various doctors. Upon opening the abdomen, a tumor the size of the head was found wedged in the pelvis (Figs. 25 and 26). After some efforts, it was delivered through the abdominal wound. It was then found to be retro-peritoneal. Tapping it, it was found to be a very vascular growth, probably malignant, and lying between the layers of the transverse meso-colon.

Posterior layer of meso-colon split, tumor enucleated, and found to be one of the pancreas. The wound was quilted from the bottom up, bringing together the two layers of the peritoneum. The stomach and colon were entirely below the umbilicus. Omentum stitched to the abdominal wall (Fig. 17), wound closed and patient made an uninterrupted recovery. Growth will no doubt return if malignant. This case I mention to illustrate another distinct cause of ptosis, namely, pulling down by a tumor.

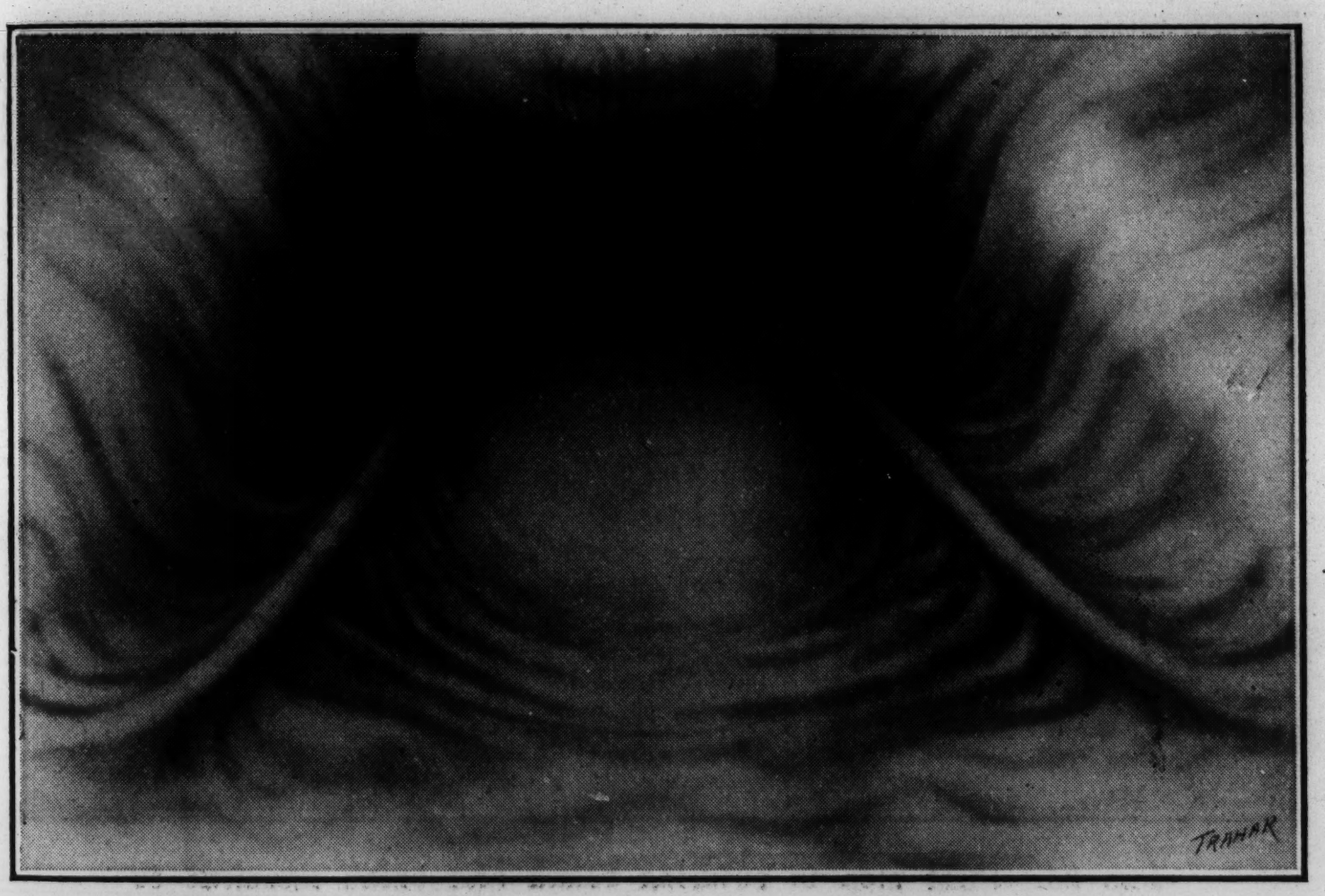


Fig. 34.—Retroversion of the uterus seen from abdominal incision.

Case 8.—Patient of Dr. Edna Timms. Condition, left ovary prolapsed and cystic, stomach prolapsed below the umbilicus (Figs. 27 and 28). Cystic portion of ovary removed, omentum stitched to the abdominal wall (Fig. 17). Patient made uninterrupted recovery and feels splendid now, but time is too short to state results.

I was led to my present method of treating displacements of the uterus by the extension of some studies of mine which was published in the *Annals of Surgery,*

October, 1903, in the treatment of pyosalpinx (Figs. 29, 30, 31 and 32), showing internal and posterior advancement of the round and broad ligaments. From this I developed internal advancement of the round and broad ligaments on the antero-lateral border of the uterus, and in certain cases plicating the peritoneum over the utero-sacral ligament in the cul-de-sac. The steps in the operation as now performed are: First, pack the intestines away from the wound with a large number of gauze sponges; second, break up adhesions; third, treat

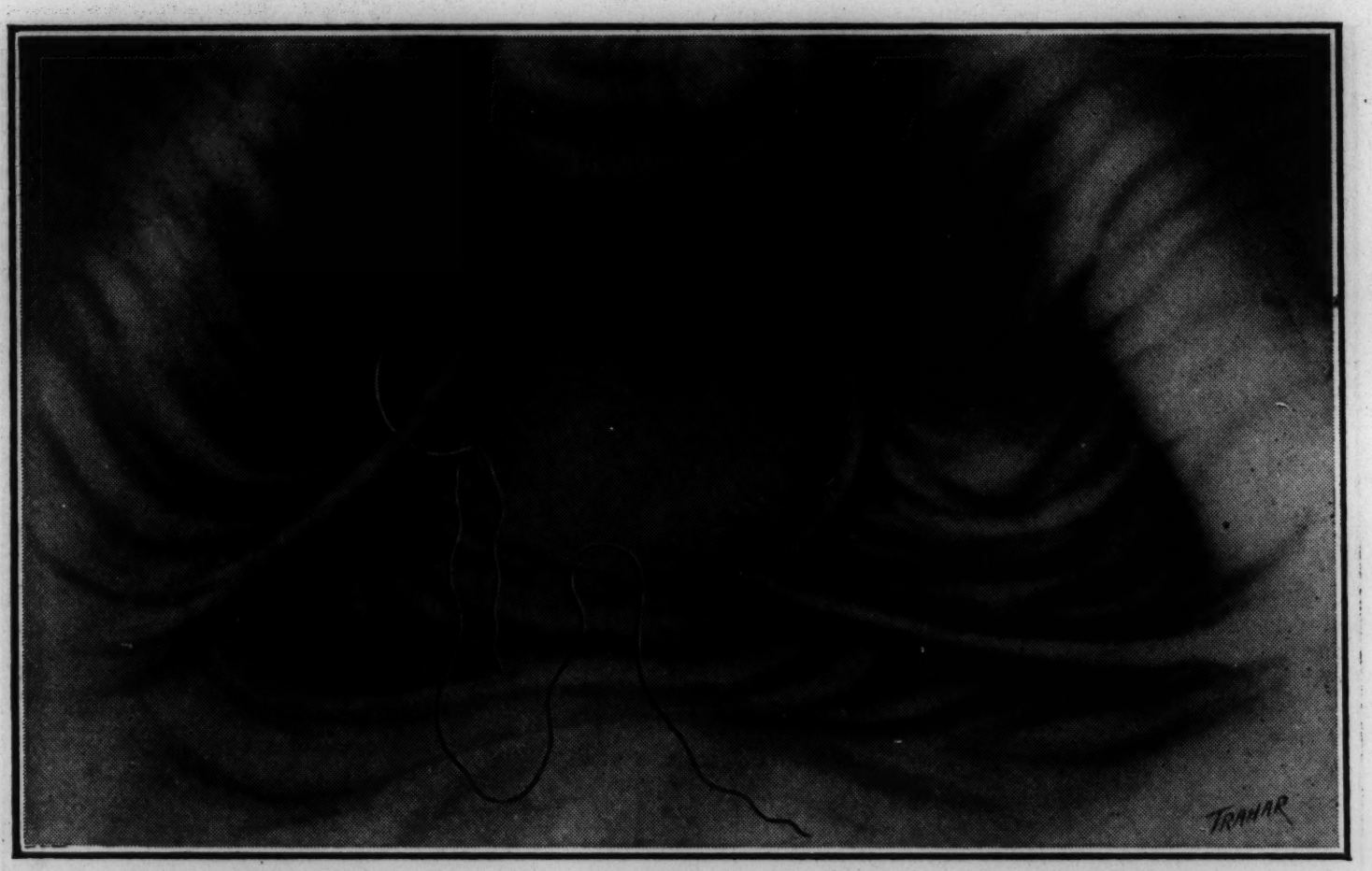


Fig. 35.—First step in suturing round and broad ligament to anterior surface of the uterus.

conservatively any pathology of the ovaries and tubes, sacrificing no healthy ovarian tissue; fourth, seize the round ligaments about an inch and a half from their uterine attachment and stitch the ligament between these two points to the antero-lateral border of the uterus with four or five interrupted formalin cumol catgut stitches, No 2. or 3 (Fig. 38); fifth, seize the round ligament about an inch and a half further on and bring back to the point of attachment and suture to the antero-lateral border of the uterus as before (Figs. 39 and 40);

sixth, cover in the interrupted sutures in front of the uterus by advancing the peritoneum of the broad ligament and stitching it to the anterior surface of the uterus with a No. 1 formalin cumol catgut (Fig. 43); seventh, shorten peritoneum back of the cervix as shown in Figs. 41 and 42. I generally return to the cornus of the uterus with the same thread. I have performed this operation now seventy-six times with much better curative results than I have received by any other method. I have done this operation almost

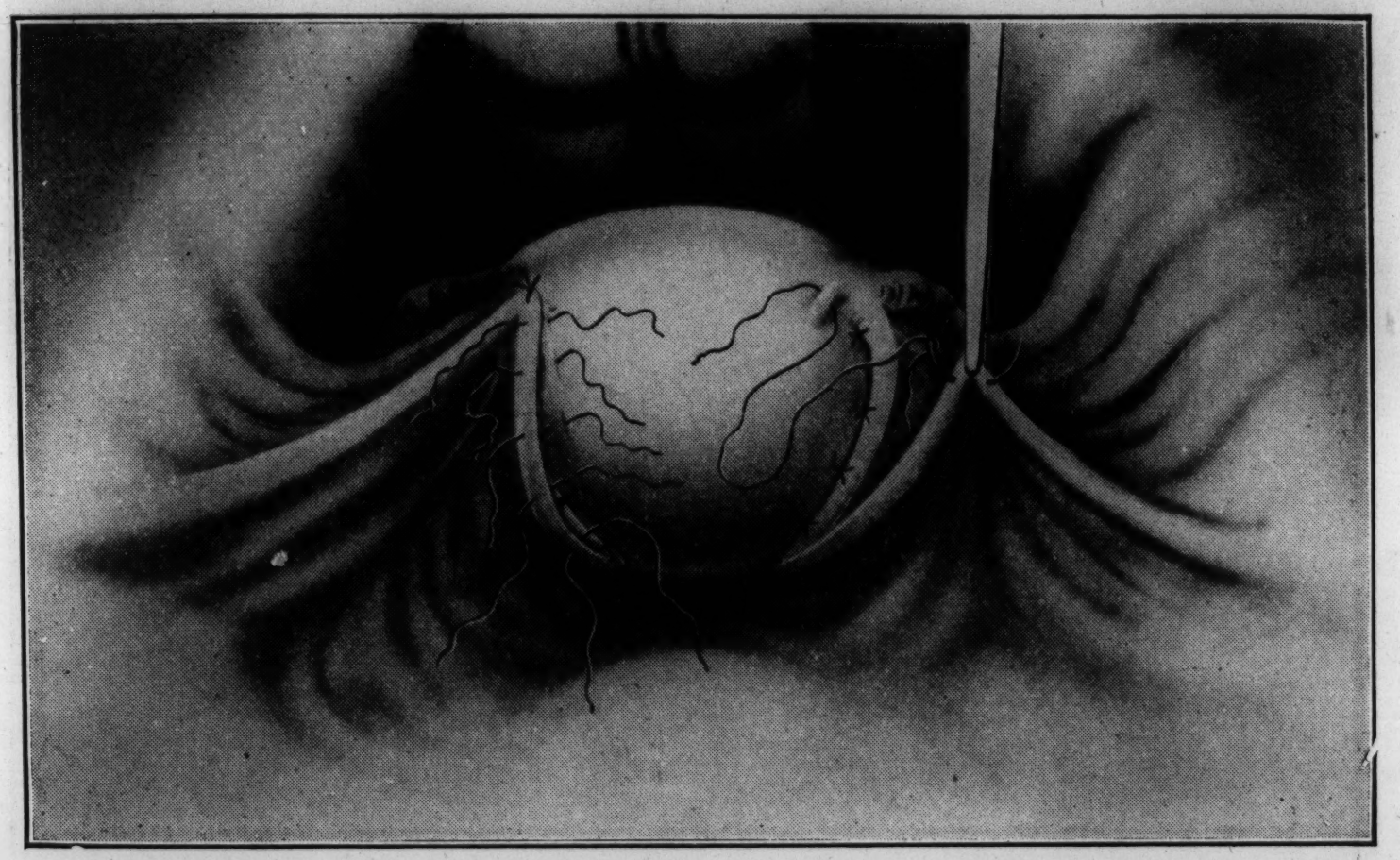


Fig. 36.—Second step in suturing round and broad ligament to anterior surface of the uterus.

exclusively for two and a half years. So far have had no deaths as a result of the operation, and have had no recurrences and no necessity for opening the abdomen at a time which would permit me to see the kind of union which had taken place. Upon three of these cases, I have at a period varying from two to six months done a curettement and operation for lacerated cervix which we thought best not to do at the time of the operation. These operations have been done upon the patients of twenty-six different physicians. Having had

time to see the results, I think there is not a single one of the physicians who would want any other operation performed upon his patient. Of this number, three of the cases were prolapses to the extent that the cervix protruded at the vulva. These cases were likewise relieved. I think I am not over-sanguine when I state that I believe that this operation has been the most satisfactory I have ever done in surgery. Theoretically it has a fault which will be related later.

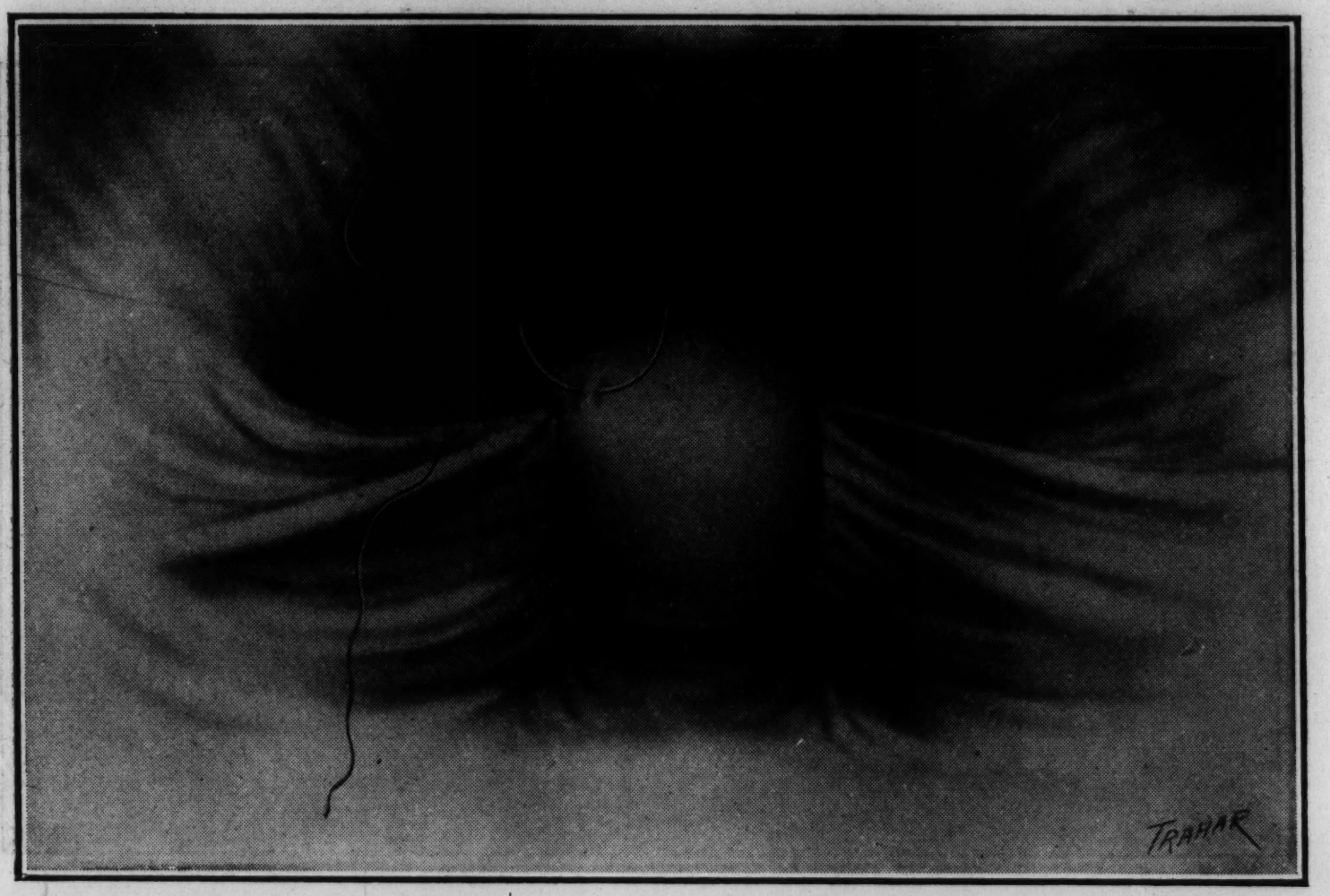


Fig. 37.—Third step. Suturing peritoneum of broad ligament overlying round ligament on left side. Completed operation right side.

In conclusion, I do not wish to attach great stress on details here represented, therefore I will ask you to consider only the principles involved and not the details of the operations *per se*, which are given purely to show the means by which I have reached my conclusions.

My conclusions are:—

1.—The peritoneum is the universal and only suspensory ligament of the organs of the abdominal and pelvic cavities.

2.—The peritoneum is attached firmly only to the diaphragm, but is attached loosely by all its outer surface to the abdominal and pelvic walls by means of loose connective tissue, which allows it to move freely, but holds it always in contact. This connective tissue is much increased around the attachment of the supports of each organ.

Irritation underneath and back of the peritoneum is followed first by an exudate which fixes it immovably

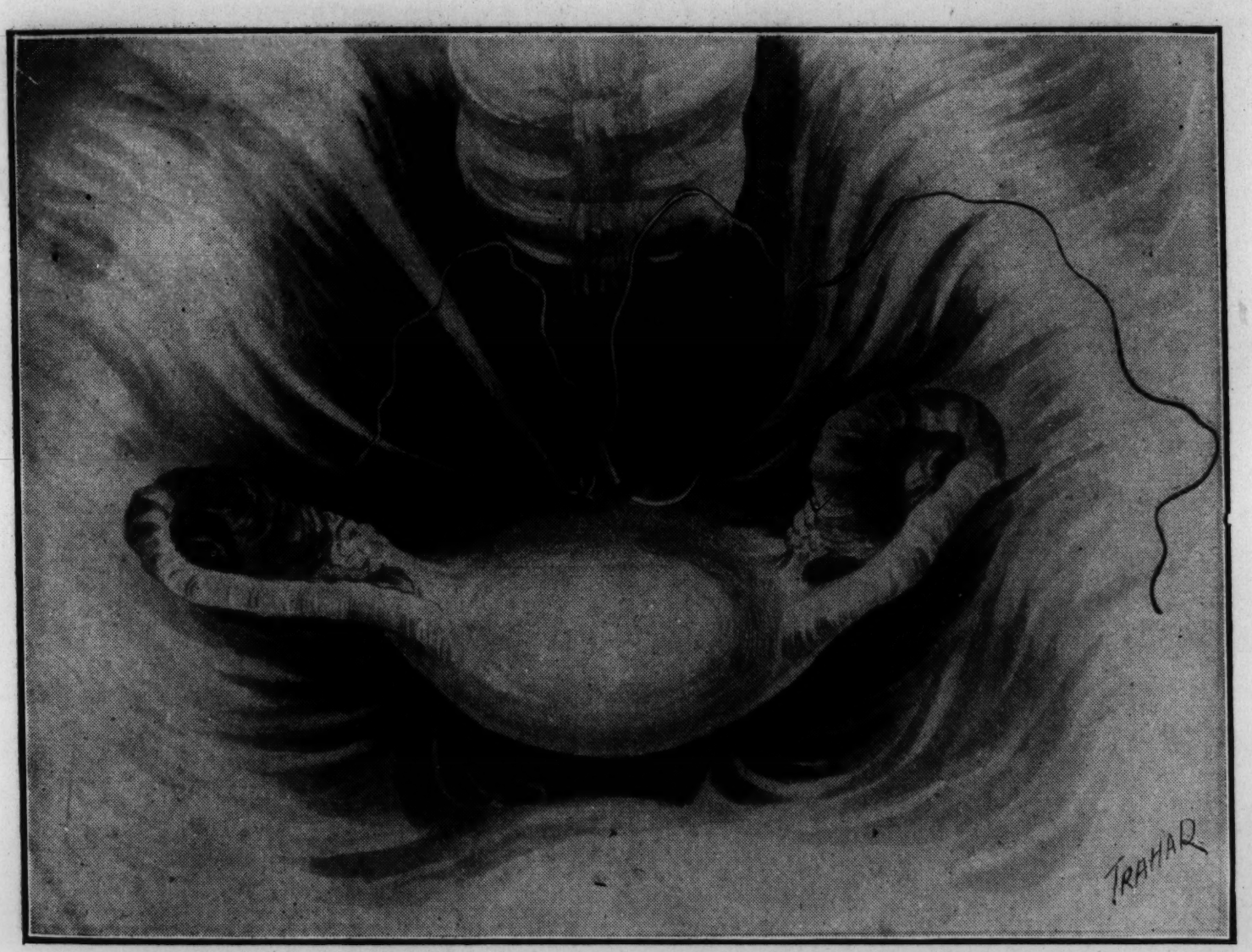


Fig. 38.—Method of plicating peritoneum to hold cervix backwards in cases of prolapse.

to the abdominal wall. This exudate is soon displaced by an increase of normal connective tissue sufficient to meet the demand. The peritoneum then again becomes movable. The peritoneum itself is but slightly elastic, its seeming elasticity being due to the elasticity of the subperitoneal connective tissue.

3.—Two peritoneal surfaces brought together and held firmly in an aseptic state blend and become one mem-

brane. If suppuration or other disturbance occurs, blending does not take place but inflammatory adhesions are formed. The former is permanent, while the latter is transitory and will be absorbed generally. This differentiation is all important.

4.—The uterus is suspended entirely by its peritoneum and connective tissue.

5.—The so-called true ligaments are not true ligaments, but muscles, and therefore perform the same

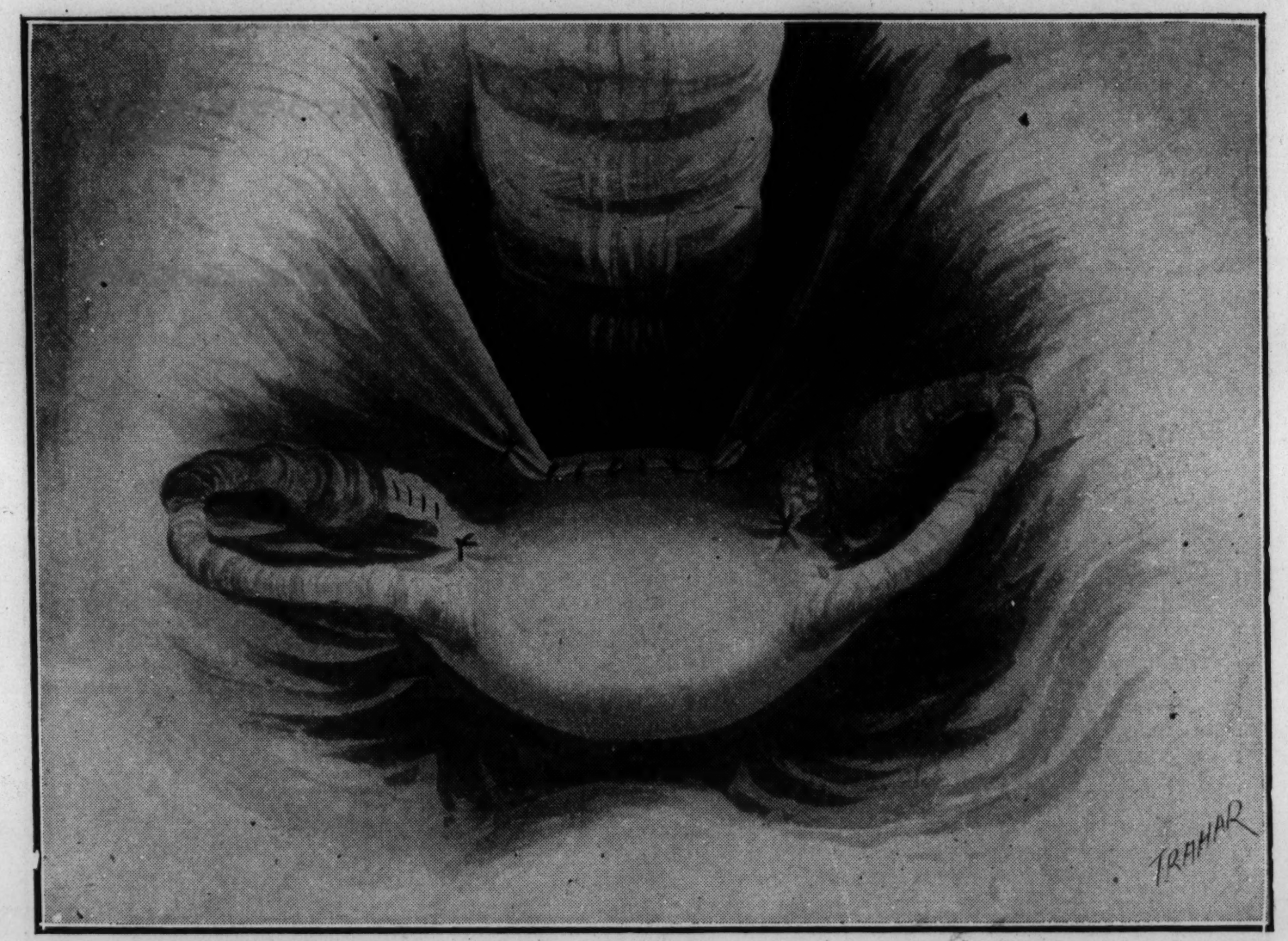


Fig. 39.—Plication of posterior peritoneum completed.

function as all other muscular fibers in the animal organism, which is intermittent contraction but never constant action. Their function is to sustain the normal poise or balance of the uterus during the changing positions of the body.

6.—Whatever may be the cause, the condition existing is a stretching of either or both the peritoneum and connective tissue. The condition may be local or gen-

eral, and may involve the support of one, more than one, or all the abdominal and pelvic organs.

7.—The treatment in a general way will be the shortening of the peritoneum at the points at fault by some method of plication and blending or by bringing the peritoneum back to its normal contact with the abdominal wall.

8.—The method here shown for suspending the liver is, I believe, almost ideal theoretically, and so far in my experience clinically and experimentally, in that it shortens the normal suspensory ligament, and supplements it as may be desired by extending the ligament on one or both lobes by the blending of peritoneum.

9.—None of the operations for gastroptosis so far are theoretically or practically ideal for all cases. The "hammock" operation, stitching the omentum to the abdominal wall, is best suited to those cases due to adhesions holding the stomach out of place by its omentum or other conditions accompanying operations in the lower abdomen or pelvis only. No discomfort has been observed by any of my patients. Posterior gastroenterostomy is the best operation for those cases due to dilatation or pyloric obstruction of any kind and is all that is necessary, as it is held by its attachment high up and well back of the transverse meso-colon.

The shortening of the gastro-hepatic omentum for gastroptosis of relaxation is apparently ideal as far as it goes, but should be supplemented by shortening the transverse meso-colon, and I believe in the cases in which enteroptosis is present, the operation of shortening the mesentery by a method somewhat like that shown in figure 4 is practicable, and has been performed upon two patients by Davis. Notwithstanding the method I have presented for the treatment of retrodisplacement and prolapsus is so far almost perfect clinically, I do not believe the operation here presented or any other intraperitoneal shortening of the round liga-

ments is theoretically ideal, as it cripples the muscular action of the ligament. Nor do I believe that any of the extraperitoneal operations are ideal, as they do not shorten the peritoneal ligaments to a sufficient extent. I believe the good results reported in these cases are largely due to the traumatism, which increases the connective tissue around the canal of Nuck, and to the fact that peritoneum which is drawn into and puckered around the canal, blends and forms a smooth surface, thus shortening the peritoneum.

The ideal operation theoretically would be extraperitoneal shortening of the round ligaments, like Noble's, or some modification which would open the abdomen in the linea alba, combined with plication of the peritoneum where relaxation exists, and in cases of retroversion and prolapse in which the cervix points to the symphysis pubes, plication of the peritoneum back of the uterus as shown in the cut. I think it will be generally admitted that the ideal operation for kidney suspension has not been used. I believe it will be found upon the basis brought out in this paper and will be done on one of the following plans: First, it may be by splitting the peritoneum either through the abdomen or from the back and turning the endothelial surface to the kidney and stitching it there, either with or without decapsulating at the point; second, making a pocket for the kidney by stitching the peritoneum to the posterior abdominal wall by a method like that described by Harris some years ago, except that the peritoneum must be slit and the endothelial side brought in contact with muscle or fascia of the back. It might possibly require a combination of these procedures to make a success. Harris' operation, as I understand it, must necessarily fail theoretically because the connective tissue side of the peritoneum cannot be made to adhere to the kidney or to a muscle or fascia, for connective tissue must surely reform and loosen it from its moor-

ings. It may be possible that a transverse plication of the peritoneum below the kidney might be sufficient to hold it, but I doubt it.

DISCUSSION.

Dr. James E. Moore, Minneapolis, Minn.—I was very much pleased when I saw the title of Dr. Coffey's paper on the program, because I am interested in this topic. I have gotten some new ideas. He has done well to enforce a principle we have all recognized if we have not used, and that is that the peritoneum is all-sufficient for the wants within the abdomen. Not long since I had my attention called to the fact that the natural support of the liver is apparently very frail, because it was testified in court that a certain patient had a prolapse of the liver. The patient fell off of a street-car, and testimony was given to the effect that the ligaments of the liver were torn. I looked over the literature and found that there were no cases reported anywhere of laceration of the ligaments of the liver except in extreme cases of traumatism. When we consider the frailty of these ligaments we must conclude that the principal support comes from below. All these organs rest upon an air cushion, and in all cases of ptosis we have a relaxed condition of the abdominal muscles which weakens the natural cushion below, which gives that support. If we had not this natural cushion, the frail ligaments of heavy organs would be insufficient to support them.

There is one procedure that was mentioned by the essayist which theoretically is ideal, that is, shortening up the mesentery. I have tried that and found it wanting. In one case, for instance, where I found the transverse colon in the pelvis, I shortened the mesentery, quilted it with chromicized gut, and reoperated upon the patient a few weeks afterwards. The transverse colon was prolapsed as before the original operation. So while that may be theoretically ideal, practically, in my limited experience, it did not come up to my expectations.

Dr. Arthur E. Hertzler, Kansas City, Mo.—I would like to ask the essayist what he means by the word peritoneum? I have examined more than eleven hundred abdomens with this same question in my mind. I have examined a great many embryos microscopically,

etc., and unless he puts a broad interpretation on what peritoneum is, I do not think his statements should go by without some qualification. There are a great many dense fibrous tissues underneath the peritoneum which go to these organs, particularly in the region of the mesentery. I have made many sections across this region, and there is strong fibrous tissue that histologically we cannot count with the peritoneum.

Just a word or two in reference to what Dr. Moore has said, and that is, the importance of air pressure. Some five or six years ago I sewed in a metal tube in the abdomen of an animal, plugged it up with cotton so that air could not get in. When this question is further studied, this attempt to hold up the abdominal viscera by peritoneum will receive a severe setback theoretically. I believe the question of air pressure here is the same as we get in the lung cavity.

Dr. B. B. Davis, Omaha, Neb.—I have been interested in this subject for many years. I feel like Dr. Moore in this regard, that the ligaments are really not very important as far as strength is concerned. They do not need much strength; at the same time, they need some strength. If you have ever tried to lift a stone while it was under water, you know that it can be done easily, but just as soon as you get that stone outside of the water it is much heavier for you, and that is something on the principle of what we have to deal with here. Theoretically, an ideal method of operating on these cases of prolapsed abdominal viscera would not be to operate upon the suspensory ligaments of these organs, or not to suspend the organs, but to do foreshortening of the abdominal wall, something like Dr. Mayo's operation for umbilical hernia, overlapping in some way to shorten the distance between the attachment of the muscles above and the pubes. I believe that would be an ideal method, but I do not see any really safe and easy way that this can be done, and up to the present time I do not think it has ever been done systematically and accomplished anything.

I have operated on seven or eight cases for complete prolapsus of the abdominal viscera. The first one was seven years ago. The first two cases were reported some six years ago at a meeting of the Missouri Valley Medical Society. In one of them everything was practically down in the pelvis—stomach, transverse colon, and other

organs were down very low, so that when the woman stood up everything bulged out in the lower portion of the abdominal cavity. Above there was nothing. She was absolutely an invalid. She was poor; had three small children, had not been able to do anything for two or three years, and was getting worse. In that case I was very anxious to give the woman some relief, if possible, and in the operation I went to work and stitched the lesser omentum up to the upper part of the peritoneum; then I shortened the gastro-colic omentum by reefs of silk between the vessels in such a way as not to cut off the circulation. Then I went to work and shortened the mesentery in exactly the manner that has been described by the essayist, putting in reefs all along between the vessels. It is true, it took a long time to do this, but not so long as I expected. In that case I could lift the intestines away up a foot above the level of the opening in the abdominal wall, on account of the very great laxity of this mesentery. After I had done this the woman made a good recovery, and in three months' time she was doing her own family work. Through a relative I have been informed that the woman and her family have moved away, and I have lost sight of them personally. However, she is able to perform her regular household duties.

The next case unfortunately committed suicide soon after the operation. Whether it was due to my operation or not, I have never been quite clear, but it was, at least, a little damper on my enthusiasm. I have operated a number of times since, and the results seem to have been satisfactory so far as relief is concerned. I believe foreshortening of the abdominal wall would be the better operation if we could only do it.

Dr. C. E. Ruth, Keokuk, Iowa—I do not care to prolong this discussion to any considerable extent. I was very much pleased to hear this most excellent paper. I wish to refer to some points that have not been brought out either in the paper or discussion, namely, the unfavorable results that sometimes occur by attaching organs to the anterior parietal peritoneal surface causing severe pain and dragging because the parietal peritoneum is supplied by sensory nerves while the visceral peritoneum is not. Some of my patients in whom I have intentionally or unintentionally secured firm connection of the visceral peritoneum, with its related organs, to the

parietes, have been tortured beyond endurance, and I have been compelled to operate in some cases several times to relieve them of the adhesions and the tugging that has occurred as the result of it. Some of you, I have no doubt, have had painful experiences in the same way. I think we must keep in mind the fact that while we may fold up and plicate the visceral peritoneum as much as we please, if we do not interfere with the normal distribution of the circulation, or make pressure upon important nerve trunks, or do not interfere with the passage of contents in the abdomen by the normal routes, we will have no pain or no disturbance of function whatever, and may relieve patients greatly. We must keep in mind the fact that the parietal peritoneum, with the attachments to it, is sensitive and may cause severe pain when compelled to carry weight.

Dr. D. N. Eisendrath, Chicago—There is one question I would like to ask Dr. Coffey, and it is this: What is the outlook after operation in a number of these cases? This is more interesting from a pathologic rather than a technical standpoint. Perhaps he can tell us something about his own experience in this regard. These cases occur, as a rule, in people who are ill-nourished, women with flabby abdominal walls, with considerable diastasis of the recti muscles. Sometimes they are comparatively young women, and the question in regard to the pathology is whether the peritoneum under these circumstances is in a different condition than it is in an individual who is in a normal condition, and whether we can improve the condition of that peritoneum by an operation.

Dr. William Jepson, Sioux City, Iowa—There is one question in connection with this subject concerning which I would like to have an explanation from the essayist. As I view the subject of ptosis of the abdominal viscera, the following factors enter into it: 1. The organs are too large to be suspended by their normal support, as, for example, an enlarged spleen, an enlarged liver, or a stomach that has suffered from dilatation. 2. A second factor in displacement is the fact that there is inadequate support, which should be afforded by the normal abdominal walls, conditions where it is abnormal, as seen in diastasis of the recti muscles, or in flabby abdominal wall muscles. 3. A third condition

is that where the intra-abdominal cavity is encroached upon possibly by the individual attempting to follow the dictates of fashion, or, again, it may be the result or consequence of disease.

I would like to know what provision is made in such cases. In looking over the charts exhibited by the essayist, they seem to be nearly all normal; that is, the charts represent a normal waist; but in many of these cases we have very narrow waists, and he said that this is overcome by shortening the peritoneal attachment of these organs. What is done to overcome the laxity of the abdominal walls, and how are the enlarged viscera treated that are themselves the prime cause of it?

DR. COFFEY (closing the discussion)—I do not expect to revolutionize the methods of treating these cases, as I know what the general impression is on this subject. I had the same opinion when I began to study the subject thoroughly. I shall not try to convince anyone of my views as to the cases described, but I wish to say that my patients are satisfied. The doctors for whom I have operated are satisfied, and I am pretty well satisfied.

DR. RUTH—Have you determined, in following these cases, whether or not there is a tendency for the old attachments to stretch out again? In plicating the peritoneum, without inflammatory action, I would like to know if tension is brought on it and maintained, whether it will distend to any extent?

DR. COFFEY—It is as strong as it was before. This you can prove by experimental methods; you can prove it by entero-enterostomy.

DR. RUTH—What do you suppose are the causative factors in these cases?

DR. COFFEY—That is a question we do not know. I did not pretend to give the cause in these cases. Dr. Clark, of Philadelphia, has done more of these operations than I have. He has done in the neighborhood of twelve operations, and performs the operation for conditions other than those for which I do it. He stitches the peritoneum to the abdominal wall. In no case that I have reported has the patient been able to attend to ordinary duties.

APPENDICITIS, WITH SPECIAL REFERENCE TO THIS DISEASE IN WOMEN.

ARCHIBALD M'LAREN, M.D.

ST. PAUL, MINN.

In considering the subject of appendicitis, it seems to me that many authors make the mistake of attempting to lay down a separate course of treatment for the various pathologic conditions found in acute and chronic appendicitis. For instance in the catarrhal, ulcerative, relapsing, suppurative, perforative, fulminating and gangrenous types. Should we not rather approach this disease in the early hours with the simple question, whether the case under discussion is either acute or chronic? for if we do not we are very apt to find that what we supposed to be a simple catarrhal appendicitis, which would recover if left to itself, has passed on to one of the severer types and the patient's chances of recovery have been greatly diminished. While if on the other hand we look at all acute cases, and especially first attacks, which are, I believe, the most dangerous, simply as acute appendicitis, we are, I am sure, more apt to treat them with greater intelligence.

I remember with regret watching a boy die whose temperature never reached 100° or pulse above 80 until three hours before his death. He had a gangrenous perforated appendix and general septic peritonitis.

Mr. Watson Cheyne believes that "a patient who is suddenly seized with griping local pain, soon followed by vomiting, the pain changing to a burning sensation in the right iliac fossa, with some muscular rigidity

and a temperature of 102° or 103°, has a simple catarrhal appendicitis which will subside in 24 hours and will pass off in two or three days." Any surgeon who follows his advice through any number of cases will frequently find himself mistaken. Within the past month I have operated on three acute cases which would follow this general description; each one taken in what was supposed at the time to be the first attack. One case, a young woman of 25, whom I have looked after in the capacity of general medical adviser, and have seen in every indisposition for the past five years, was found to have a chronic appendicitis with adhesions. The second, a child of 13 years, whom I have attended ever since her birth. I operated upon her eighteen hours after the commencement of apparently her first acute attack, and found a very large, dilated, twisted appendix, strongly adherent to the outside of the cecum and to the pelvic wall with old adhesions, and containing at least one dram of pus. She had never been a very robust child and was a very colicky baby. Her primary appendicitis must have occurred when she was less than a year old.

The last case was particularly interesting. A young woman of 18 was taken with severe local pain at 5 p. m., soon followed by vomiting. She had a small hypodermic injection, but could not sleep that night. The next morning her pain was almost gone and her temperature was 101°, pulse 100; she was quite tender over McBurney's point while lying on the back. When I turned her on the left side the tender point moved over to the center line, showing that the inflamed appendix was not adherent. I operated upon her at 11 a. m. the same morning, and found a large rigid, acutely inflamed appendix, twisted on its long axis and adherent to itself, but to nothing else. It was covered with yellow fibrinous plates of lymph. Opening it I found an acutely inflamed mucous membrane

lining the upper portion of the organ, while the mucous membrane of the tip of the appendix for a distance of one inch was blue black, with small gray and green spots throughout, showing a commencing gangrene of the lining layers, which had not as yet reached the peritoneum. All three of these patients recovered without a single bad symptom, and as no drainage was necessary and McBurney's cross-muscle incision had been used, there will be no danger of hernia.

There can be no question in the mind of every surgeon, that in case of acute appendicitis there is a time when the appendix can be removed, with a mortality of only 1 or 2 per cent.

In the light of recent experiences, I believe that the only safe advice both for the patient and the medical man, is, that the appendix should be immediately removed in the early hours of every acute attack of appendicitis, and especially in first attacks, when the symptoms last six hours.

On the other hand, I do not believe that every case of appendicitis should be operated upon as soon as the diagnosis is made; because we frequently do not see these cases until from the third to the sixth day. The favorable time has now passed, and as Richardson says, some of these cases are in such a bad condition that the operation itself may be enough to take away the only remaining chance of recovery. Still I do not believe in waiting long. The prolonged starvation treatment advised by Ochsner I have seen followed by bad results. It is a wise line of treatment especially in the warning regarding the giving of cathartics and foods, and in Ochsner's hands, I know that the results are good, but in the hands of men of less skill and experience, the results have not been good.

As has often been said, each case must be decided upon its own merits. He must be either a very wise or a very self-satisfied man who does not feel that in such

and such a case he made a mistake by either delaying too long or in operating too soon. Mr. C. B. Lockwood said in a recent Harveian Lecture: "In hardly any other disease can it be said with so much truth, that judgment is difficult, experience fallacious and opportunity fleeting."

If, however, the patient, either by good fortune or wise management, can be carried over the first seven days of the acute or suppurative attack, his chance of recovery from an operation is greatly improved. I have operated upon 72 cases of suppurative and gangrenous types, with 15 deaths, or a mortality of 22.5 per cent.

I believe that I can improve upon this mortality, for in the last 28 operations for suppurative appendicitis there are only 3 deaths, or a mortality of little more than 10 per cent.

In reviewing these cases with reference to the day of operation, I find that there are five operations on the first day of attack, with one death. This man suffered from a perforation with his first pain, for, ten hours later, I found a small abscess with cobweb-like walls about his perforated appendix.

On the second day there were 7 cases, with 2 deaths.

On the third day 12 cases, with 3 deaths.

On the fourth day 9 cases, and 6 deaths.

On the fifth day 6 cases, and 1 death.

On the sixth day, 6 cases, and 2 deaths.

On the seventh day 3 cases, with 1 death.

Over one week 23 cases, with 1 death, which was due to gangrene of the cecum. With some of these cases I would to-day postpone the operation a little longer; others I would operate on more quickly.

The ideal results of an operation in the first twenty-four hours are not to be compared with the tedious and dangerous recoveries of the later operations. But unfortunately we do not see many acute cases in the first or even in the second twenty-four hours. The

fourth, fifth and sixth days are unquestionaby the most dangerous days for the patient, either with or without an operation. I can recall at this moment six cases whom I have known, who died on one of these fatal days without any operation.

In May, 1903, I prepared this for print, but never read or published it. At that time I doubted the wisdom of the teachings of Ochsner, but my own results as just quoted convinced me that he was correct. Since that time I have operated upon 33 acute suppurative cases with 2 deaths, or a mortality of 6 per cent. Three of these acute cases were operated on on the first day; one on the sixth day. There were two operations on the seventh day; on and after the eighth day, 27 cases. Out of this number there were two deaths. The first was operated on by mistake on the sixth day of his attack, under the impression that he was suffering from obstruction. This man died on the third day after operation, after opening and draining an abscess containing thin serous pus.

The only other death was one month after operation, from prolonged suppuration of a drained abscess. Of this last number (27 cases) there were three cases seen on the second, third and fourth days of what appeared to be acute septic peritonitis which developed into localized abscesses under starvation and ice-bags, to be successfully operated on after the eighth day. One other case, a man, was seen on the third day in consultation in the country; operation was not advised and he died on the sixth day. This case should be included, making a mortality of .088 per cent.

APPENDICITIS IN WOMEN.

We still hear the statement made that appendicitis is much more common in men than it is in women. I do not believe this to be a fact, with regard to chronic appendicitis. I do believe that acute appendicitis is more common in men than in women, but chronic in-

flammation is much more common in women, and is frequently overlooked because it is chronic from the first. In many instances I have removed a diseased appendix and cured the patient, where diseased appendages had formerly been removed without relief.

I have made 422 appendectomies. In the first 241 there were 72 suppurative cases. Of these there were 42 men and 30 women, in spite of the fact that my work is largely the surgery of women. During the same time I had removed appendices showing chronic inflammatory changes 153 times in women and only seventeen times in men. I do not quote these figures for the purpose of giving the impression that they fulfill my idea of the true relationship of chronic appendicitis in the sexes. I do not believe that chronic appendicitis is as frequent in the male as in the female, but it probably is not twice as frequent in the latter sex. It is, I believe, only a curious accident that I have seen proportionately so many acute cases in men and so very few chronic cases.

One reason for this greater frequency of chronic appendicitis in women is unquestionably due to the close relation of the right appendage with the appendix. I have found a diseased appendix associated with the inflamed appendages 48 times and in many of these cases it has seemed to me that the cause of the pelvic inflammation was originally an appendicitis.

I remember one case which was particularly interesting in this connection: A young girl of 20 had suffered from a very severe attack of peritonitis when thirteen years of age, which had kept her in bed for over a month. She had never been a very strong girl, but had not been particularly ill until shortly before I saw her.

I found a pelvic abscess and made a vaginal section, letting out a pint of offensive pus. She promptly recovered. Five weeks after this operation she had a typical

attack of appendicitis, and later I removed an inflamed appendix and found both appendages normal, although covered by adhesions which bound them to the sides of the pelvis and the back of the broad ligaments.

I have found accumulations of pus or sero-pus in the pelvis fifteen times in connection with a diseased appendix.

It has seemed to me that vaginal section in women or rectal incision in men is a valuable procedure in these cases before opening the abdomen, for the quantity of pus as well as the quality is an important element in the mortality of all cases with intraperitoneal accumulations of pus, from whatever cause.

Chronic appendicitis now seems to be the most important and the most common of abdominal and pelvic diseases in women. The suggestion has often been made that there is some relationship between a movable kidney and chronic appendicitis. My opinion is that it is only a relationship by accident, that the movable kidney is not a diseased condition nine times out of ten, and that if a woman who has a movable kidney and is suffering from pain with her right side, will have her appendix removed and her kidney left alone, provided that there is no urinary symptoms, that she will be cured. I am also becoming very suspicious of a large number of cases of retro-displacement, particularly in women who have not borne children, upon whom we have been exercising our mechanical ingenuity for the past few years.

Appendicitis or adhesions following a first attack through interfering with the appendages or uterus, is responsible for many cases of sterility, and sterility in an indirect way seems to be the cause of uterine fibroids. It is the uterus which never bears a child which seems to be prone to grow fibromata. In the past one and one-half years I have found evidence of a past inflammation about the appendix in 26 cases where hysterec-

tomy was necessary for uterine fibroids. There are many women with irritable bladders, drifting about the country from one man to another and finding no relief. As a profession we have not fully realized that the peritoneal coat of the bladder is just as important and more painful than the mucous coat. I have seen a number of these women who had been irrigated, painted and distended in vain, whose irritable bladders were relieved by removing an old chronic appendix.

I have found chronic appendicitis associated with intense dysmenorrhea twelve times. The removal of the appendix produced a perfect cure seven times, the other five cases were not much relieved.

Ochsner was one of the first to note the relationship between appendicitis and gallstones. I believe that here we have a true relationship of cause and effect. The appendix first becomes inflamed, later we have primary cholecystitis without stones, several years later a secondary cholecystitis with stones. In the past eighteen months I have found chronic appendicitis and gallstones in the same case fourteen times.

I have operated upon seven pregnant women; two acute cases, five chronic. In the first one the appendix was removed on the second day of an acute attack, during the fourth month of pregnancy. The woman recovered and later was delivered without complications.

Another case was a primipara eight months pregnant. She was seen on the fourth day of the attack; she was operated upon that same night. On account of the intra-abdominal pressure the operation proved a very difficult one. Her appendix was found under the uterus, gangrenous and perforated with a commencing septic peritonitis. This woman lived only twenty-four hours. The others all recovered and the pregnancies were not disturbed.

In eight Bassini operations for the radical cure of hernia, I have found no difficulty in bringing down and

removing a chronically inflamed appendix through the herniotomy wound, and so have avoided the making of a separate opening.

The mortality of operations for chronic appendicitis is very small. I have had seven deaths; five of these were unquestionably due to the complicating conditions. One from exhaustion following a pyloroplasty which should have been either a Finney, or better, a gastro-enterostomy. Four other cases died following either a supravaginal amputation or a panhysterectomy with suppurative appendages. In two cases it has seemed to me the removal of the appendix probably was the cause of death. In the last case I removed an adherent appendix and broke up some old, very dense adhesions in the pelvis, behind the uterus, then made a ventro-suspension with one silkworm gut suture which was brought out on the skin surface.

This woman died suddenly on the third day with symptoms of intestinal perforation. At the postmortem examination there was evidence of a mild pelvic peritonitis with a little bloody serum in the pelvis, and the stump of the appendix was found to be open and turned out, the single catgut purse-string suture having been absorbed. I have used catgut and Dawbarn's method of inverting the stump of the appendix for several years, and this is the first time that I have ever seen trouble arise following its use.

An experience like this would make one question the wisdom of using catgut in these cases in preference to silk. Silk, even though perfectly clean and sterile, when introduced into the wound, if it becomes infected will act as a foreign body. For instance, in one of my early appendectomies the silk sutures gave trouble and were discharged, the last one coming away nine years after the operation.

In the operation for the removal of the appendix, I have found the method described by Ochsner very satis-

factory. The turning in of the stump is more easily accomplished if the purse-string suture is left long in a loop opposite to the two free ends of the suture. If an assistant holds this loop while the surgeon crosses and pulls taut the free ends, the head of the cecum is held up and steadied while the stump is being pushed clear in.

Since the death of my patient from the giving way of the single catgut purse-string suture, some three years ago, of which I have already spoken, I have added a second suture like the first, turning in about the sixteenth of an inch more of the face of the cecum. I first used linen for this second suture, but so many of my patients complained so bitterly of colicky pains, some of them for over a year after the operation, that of late I have substituted pyotannin catgut for the linen. Since this change, now over a year ago, the number of patients who return with cecal pains is very much reduced.

Simple ligation and cauterization of the stump as advised by Richardson, Seelig and others has been in my experience followed in many instances by these same annoying postoperative cecal pains.

DISCUSSION.

Dr. Alexander Hugh Ferguson, Chicago— I believe that in every association like this some paper ought to be produced upon appendicitis if for nothing else than to keep the subject alive before the members, and to keep them within the proper line of being life-saving individuals.

The experience of Dr. MacLaren has not been very much unlike that of most of us, and he has given us an admirable résumé of his own work. We ought to have, at least, three distinct classes of suppurative cases from a pathologic standpoint: (1) Intra-appendicular suppuration; (2) extra-appendicular suppuration, which is circumscribed and walled off, and (3) extra-appendicular, in which we find pus in the general abdominal cavity. This distinction is often made only while the surgeon is operating, and the management and technic

of treatment is quite different in each condition. I do not establish a time limit when to operate. All there is to be done in a number of cases is to cut through the abdominal wall and drain. It is much better to open through three insignificant muscles and peritoneum than to go on doubting and waiting as to whether or not the germs within this inflammatory area become less virulent. Waiting for the sterility of these germs has cost thousands of lives.

What effect has the washing out of the rectum with a little salt solution upon the progress of the pathology in the region of the appendix, say four or five feet away from it? What is the effect upon the pathology to wash out the stomach twenty feet away from the pathologic condition? While we all admit that a loaded rectum, sigmoid and colon should be emptied, and that a stomach, if it is not emptied by emesis, should be washed out—outside of that, what benefit does it do? How does it control the pathology? The time limit should be discarded, because a number of these cases can be considered instances of chronic appendicitis before we see them. Ulceration has gone in many instances through the mucous membrane, the submucosa, and through the muscular tissue, and when it has reached the peritoneum prominent symptoms manifest themselves, as in perforative appendicitis. That being often the case, why wait six hours and lose the patient?

Dr. B. B. Davis, Omaha, Neb.—I do not know that I have anything particularly to say contrary to the remarks of Dr. Ferguson; but I do not really see any reason thus far for following the plan of operating on every case of appendicitis as soon as I see it, if I see the case late in the disease. But I do feel that the early cases should be operated on at once, just as soon as we can possibly do the operation. I feel that I may change my mind after a while, as there are some cases we get five or six days after the onset of the disease that are not very bad. They have gone through the worst of the attack, and we do know that a particular class of cases sometimes succumb to our surprise when we perhaps have not found any very great amount of pathology at the time. That is to say, I have lost some cases that I feel if I had tided them over might possibly have gotten well. So I have been following this plan lately: If I see a case in the third, fourth, or sixth day after

the beginning of the attack, I have a leucocyte count made. While the leucocyte count has been frowned upon a good deal, in my experience in this particular trouble, when I have found decided leucocytosis, running above nine thousand or ten thousand, there has been pus. When I find leucocytosis I operate at once. It takes but a few minutes to make a leucocyte count. If we do not find leucocytes on the fourth or sixth day, I do not operate. Understand, I do not let the patient get up until the appendix is removed. He is led to understand that we are allowing him to go on to the most favorable time for operation. I hold him for several days until I am satisfied it is the most appropriate time to operate, and then take out his appendix. There are a certain number of cases at that particular stage, the dangerous stage, that had better be tided over and operated upon a little later. This is a more prudent policy to pursue than to plunge in and operate just as soon as we see these cases.

I think the last word has not been spoken in regard to appendicitis, and I believe at the present time that my mortality has been better in the last few years by practicing those methods than by operating on cases as soon as the diagnosis was made.

Dr. James E. Moore, Minneapolis, Minn.—I understand that this paper deals with appendicitis in women. There have been three cases within my experience in the last year of special interest, occuring in young girls, two of them sixteen years of age, and one seventeen, all of whom I was able to save by making a vaginal section. In one of them I did anterior colpotomy, saved life, and removed the appendix at a later date.

For some years I have taken the position that the pregnant woman is entitled to the same consideration, when suffering from appendicitis, as any one else, and that our rule for operating on them should be the same as for other people.

As to the treatment of the stump, you can deal with it in any way, and the patient will get well. You must cover up raw surfaces, leaving only peritoneal surface exposed. Just how you do this is immaterial.

The question arises, shall we remove the appendix during any other abdominal operation we perform? While we should not take an extreme position in this matter, whenever we find something wrong with the

appendix when operating for some other intra-abdominal condition, it seems to me we are not doing the patient or ourselves justice if we do not remove the appendix.

Dr. Ferguson still insists that the time to operate on a case of appendicitis is when the diagnosis is made. I thought that a number of years ago, and I believe I killed a number of patients before I knew better.

In appendicitis, like any other disease, the time to operate is not when the diagnosis is made, but when you are likely to save life. I am thoroughly convinced from my present experience that we should not operate on all cases as soon as the diagnosis is made, and by following out this plan in recent years I know that my mortality rate has diminished materially.

Dr. J. W. Andrews, Mankato, Minn.—I have operated on nearly three hundred cases of appendicitis. I did not understand Dr. Ferguson to make the statement that was credited to him by Dr. Moore, but if he did, then I must take exception to it, as I have to similar statements made by Murphy, Deaver, and others. I thoroughly believe that we should not fix a time limit on operations for appendicitis. That is wrong. It may be six hours, two days, or three days; but the old custom of fixing a limit and saying, you must operate within twenty-four or forty-eight hours, or not operate, is wrong. It depends on the condition of the patient. Some patients are in better condition after they have been sick with appendicitis for forty-eight hours than others who have been sick only six or eight hours. If a patient has a rapid pulse and a reasonably high temperature, the pulse running up to 112 or 120, we had better leave that patient alone, whether it be six hours, or two or four days, because just as sure as we operate on patients with these acute symptoms, whether there be leucocytosis or not, we are going to lose a large percentage of them. I will admit that it is true some patients in that condition can be snatched from the grave, as it were. But the man who is operating upon acute cases of appendicitis, that are in a septic condition, will see so many cases that he will not be able to snatch from the grave, that people will begin to lose confidence in him. Thousands of lives have been lost by the erroneous teaching that we should operate as soon as the diagnosis is made. Gentlemen, study your case first.

Make a microscopic examination, if you want to, and see if there is leucocytosis. You may find leucocytosis or the absence of it, as I have in one case, in which there was a large quantity of pus. I thought I could go in through the rectus muscle, make a nice, small wound, and get at the appendix and remove it because there was apparently no pus. The microscope showed an entire absence of pus, yet I never got into a worse pus cavity in my life. Fortunately, my patient recovered. Gentlemen, I have not had as large an experience as many of you, but I have had enough to become firm in the belief that we should not operate on the acute, septic cases of appendicitis as soon as the diagnosis is made. We may use the Ochsner treatment or any other treatment until we tide them over, but do not operate at that time.

DR. MACLAREN (closing the discussion)—My paper was a short one, consequently I did not go into an extensive discussion of the different varieties of acute cases, because the paper would have been too tedious. I simply included in the suppurative type both intra-, extra-, and general suppurative case. I had to make that distinction to separate them for my own conclusions. My original opinion was that Ochsner was wrong. I do not say that I believe Ochsner is right now in the position he takes. I do not think it is so very important to give cathartics until the appendix is opened, and unless the appendix connects with the intestinal canal, whether you give cathartics or not, it is not of any importance. It is only in rare cases that the appendix is open and connects with the intestinal canal. It is a good thing, as we all know, to clean out the bowel as well as the stomach. In my first 75 cases the total mortality was 22 per cent. In the last 33 acute cases the mortality was much better. I am improving my statistics by including intra-suppurative appendicitis, where pus is present only inside the appendix. Of course, the mortality there is comparatively small; but they are acute cases, nevertheless, and they would, in the majority of instances, be perforative in a very short time. In my last 34 cases there was a mortality of only 8 per cent., and this was by making a certain number of these cases run their own risk. I asked one of my surgical friends not long ago if his own child was sick and she could not be operated on in the first forty-

eight hours, would he still hold to the opinion that she ought not to be operated on on the fourth or sixth day. He replied, "No one shall open the abdomen of any child of mine after forty-eight hours until the week is up after the first forty-eight hours. She must run her own risk."

My conclusion is that if a hundred patients run their own risk after the first forty-eight hours and are not operated on until after the eighth day, many more will be alive than if the same surgeon should operate on these same cases when he makes the diagnosis. We can not tell what cases are going on to abscess, and which ones are going to die from suppurative peritonitis. We can not tell from the appearance—at least, I can not. I have only operated on a hundred acute suppurative cases.

MANAGEMENT OF HOSPITALS IN CITIES OF 100,000 OR LESS.

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DES MOINES, IOWA.

The problems involved in the management of hospitals in the smaller cities are difficult and complicated, growing out of two important facts: First, the supposed self-interest of individual members of the medical profession; second, the lack of experience and knowledge on the part of boards of management.

The first is the most important, for it is through the want of harmony on the part of the profession that the greatest confusion is introduced into the deliberations of hospital boards, whose inexperience renders it impossible for them to distinguish between selfish personal interest and zeal in the upbuilding of high grade medical institutions.

Public hospitals are generally of three kinds as determined by the auspices under which they are organized and in part supported.

First: Hospitals under the auspices of some church.

Second: Hospitals under the auspices of some society.

Third: City hospitals supported by public taxation.

The weakness of these hospitals in small cities as compared with high grade medical institutions, are essentially the same, differing only in details. In the large cities, the two first classes escape many of the troubles of the small cities, on account of the greater experience of the management and on account of the

competition which demands a higher grade of work in order to secure patronage and closer care in administration.

City, public or county hospitals are everywhere dominated by politics, which necessarily places them in a class by themselves.

In recent years the building of hospitals in small towns of 5,000 to 10,000 or more inhabitants has created a feeling of uneasiness in the minds of medical gentlemen connected with the great hospitals which are organized and maintained on a scientific basis, but this feeling is gradually giving place to a sense of security on the part of these gentlemen, who are beginning to see that the want of organization and of a definite policy do not make these institutions dangerous competitors except in isolated instances.

When a hospital is built in a smaller city a board is constituted of active members of the church or society, with small regard to their knowledge of such matters, and who have little time or disposition to inform themselves as to the best methods of management. Very naturally, this board at once places the direct management of the institution in the hands of some person trained in their own church hospitals, or at least is an active member of their church; this is quite proper, for it may be assumed at once that no church or society has the exclusive knowledge of proper training. This method of appointment is liable to abuse only when piety or church zeal is mistaken for knowledge or competency.

The appointment of medical officers is the weakest point in the organization of the smaller hospitals. In the high grade hospitals some medical gentleman, eminent in his profession, is selected to serve as chief medical officer, who consults with the board as to the proper medical organization and to advise as to the selection of other members of the staff. It is apparent that the more eminent the staff the more successfully will the

hospital appeal to the professional and lay elements of the public.

The uninformed board takes quite a different view of the subject and insists that the entire profession be invited without regard to competency, loyalty to the institution or harmonious relations, and it often happens that the most pretentious and least honest and competent gain an undue influence in the councils of the board.

It is unfortunately true that there are men in the medical profession who look on their work as primarily commercial, and that to secure patients, by whatsoever means, is perfectly legitimate.

Ideas of practice based on this theory often lead to questionable methods or at least to a feeling of suspicion on the part of their associates, which destroys harmony and good feeling among medical men who have practically the same relations to the hospital.

There are other men who, while not distinctively comercial, are influenced by an inordinate ambition to become surgeons, which amounts almost to a mania for operative undertaking.

The ambition to become great is certainly laudable, but when the gratification of this feeling is to be reached by a short cut through some hospital which will admit him to its wards and operating room, it may not wholly escape censure.

It may be admitted that every man will reach his proper level in time, and the distinction between the pretentious and untrained and the conscientious and trained surgeon will be discovered; but this is slower in medicine than in almost any other calling, for very obvious reasons.

The distinction between the competent and incompetent will be discovered earlier if each man stands on his own merits, but if adventitious circumstances intervene, the question becomes less personal; for instance, if men of widely different degrees of skill, honesty and ability

enjoy equal hospital standing, the difference may be compensated for by different methods of doing business, as for instance, paying commissions to outside doctors who may thus divert certain cases from natural channels.

The hospital may deprecate this, but is unwilling to stop it by weeding from its staff men who are guilty of questionable or dishonorable methods, and the surgeon only falls into disfavor with the hospital when he condemns its course. This short-sighted policy ultimately leads to a material loss of standing and influence in the profession and with the general public; not only does it damage the character of the hospital, but it impairs the standing and influence of the entire profession in that community. There are communities where able and skillful surgeons are found, who all sink to a level of mediocrity on account of the nature of the hospital service, and the best work drifts to other towns, where different conditions exist. The hospitals may deplore this fact and insist that the profession itself should cure this by admitting only able men into the profession. This is only a makeshift excuse and would not be made if the hospital itself had any proper conception of its responsibilities.

Three methods of hospital organization are generally met with in this country, which I shall endeavor to describe and point out as nearly as possible in their relative merits.

It is assumed that a hospital is organized for the purpose of caring for the sick of all classes, from those who seek medical aid as subjects of charity, to those who are able to pay small sums, and those who are able to pay for any luxury which money will obtain, and it is the intention to provide in a proper manner for all these cases.

The central idea is, that every patient, rich or poor, who is admitted, shall receive the best surgical and medical skill and the most careful and diligent nursing.

The hospital will contend that they are responsible only for the nursing and not for medical skill, that the latter is a matter entirely between the patient and the doctor.

The question arises in this connection, is a hospital entirely free from a moral responsibility for the act of a patient and a doctor? If it is criminal practice, the answer would be, "Yes." If it is a hysterectomy or a gall bladder case, by a medical man who had never seen the inside of an abdomen, the answer would be, "No,"—that it is merely a matter of the patient's choice, for which the patient is alone responsible, notwithstanding the fact that the hospital was fully aware of the doctor's inexperience and incompetency.

The logic of this is not quite clear, although it serves to quiet the conscience of many institutions.

The first and best method is to appoint a chief physician and a chief surgeon, who shall bear a close relation to the managing board and who may select one or two assistants who shall be appointed by the board with continuous service. All patients who may be admitted as public charges or in the name of charity, or who occupy public wards, shall of necessity come under the care of the chief physician or chief surgeon or their assistants. This does not include private pay-patients, but in fact is so far-reaching in its practical effects that the choice of the patient is limited to men of recognized skill and ability in their respective branches of work.

The special departments of ophthalmology, otology, gynecology and neurology may be provided for in the same manner, although it would be much more to the purpose if gynecology was made a part of surgery.

Every large hospital or hospitals of 50 beds or more should have a competent pathologist, who should, in connection with the chiefs of departments or their assistants, study each case in the light of scientific investigation, that the fullest knowledge of the condition of the patient may be reached before a definite course

of treatment is instituted, and also that during the course of treatment such additional light should be shed on the case as laboratory inquiry may afford. An important consideration which many hospitals lose sight of, is the selection of a competent anesthetist. It not infrequently happens that this very important function is delegated to some inexperienced and perhaps careless interne whose thoughts and attention are centered on the operation which he feels he ought to do or soon expects to do, and the condition of the patient is forgotten, with the result of too high a mortality, either immediate or perhaps a little more remote, for it is no doubt true that the condition of the patient from the anesthesia has some bearing on the success of the operation.

In some hospitals, in order to secure continuous service, a trained nurse has been educated in the art of administering anesthetics. In addition to the advantage of securing continuous service and a high degree of skill from long-continued experience, the trained female anesthetist is not devoting any of her time and attention during the anesthesia to the details of the surgical procedure, which the young doctor contemplates employing shortly in his own practice.

The continuous service plan of staff organization will not be popular in our smaller cities as long as every young graduate is expecting a career in surgery; in fact, any plan which tends to restrict the operating mania which is sweeping over the country will meet with serious opposition, and some compromise must be made.

In the smaller cities where only one or two hospitals of 50 beds or less can be maintained, unless there are one or two men of preponderating professional influence, every respectable surgeon will be invited to bring and treat his patients and all be accorded equal privileges. This will have a leveling influence in the profession and will bring the reputation of the hospital and of the profession to practically the level of the poorest work

done, for the high-grade work of one or two operators will be offset by the lower grade work of the majority. The inevitable result is that in such communities the profession will suffer the humiliation of seeing the best work going to other cities, unless one or two surgeons can either build or influence the organization of a hospital, where their more advanced ideas can prevail and where the character of the work can challenge the respect and confidence of the local and surrounding communities.

In larger cities, which can maintain one or two hospitals of from 50 to 100 and more beds, the local prestige of the city will have an influence in bringing more or less work irrespective of the character of the hospitals or the work done. There will, therefore, be a demand for better organization and a higher grade work, unless the profession choose to sink to a level lower than their neighbors in other professions and business.

In cities which are able to maintain two or more hospitals of from 50 to 100 beds each, if the more ideal plan of continuous service cannot be adopted, a compromise may be made which will obviate some of the most objectionable features of a general and unorganized service which seems to be necessary in the small hospitals of the smaller towns, which unfortunately are not endowed and depend entirely on their immediate earnings and uncertain donations. These hospitals must depend almost entirely on the immediate surrounding communities.

The compromise referred to, is a continuous service of three months for each, the medical and surgical side, and each should be chief physician or chief surgeon during his term of service and each should have one or two assistants as the exigencies of the service may require. The assistants should be nominated by the chief and appointed by the hospital board. It is obvious that a full measure of responsibility should be accepted by both the chief of staff and the hospital, and that there

should be a sympathetic and harmonious relation existing between the hospital and its medical officers. The services of the pathologist and anesthetist should be continuous.

The public service of the hospital could in this way become practically uniform, and under the existing conditions of travel and interchange of ideas, a rivalry as to who could render the best service would stimulate the different services to reach the highest standards possible. This would probably not do away altogether with certain evils which arise in the conduct of private cases, where physicians or surgeons outside the regular staff are admitted, but the adoption of standards of work would have a moral effect on those who sought the advantage of the hospital and would be salutary at least. The very natural effect would be to drive those employing uncertain and doubtful methods to hospitals where no questions are asked. These ideas would probably raise questions of doubt in the minds of boards of management who, in most instances, persistently hold to the theory that everything should be done to invite all classes of physicians who can lay claim to respectability to bring their patients. A little more far-seeing wisdom would convince them that the public is just as much influenced by the reputation of a hospital as by the reputation of men or any institution or enterprise.

The same wisdom which seeks to base the success of the hospital on its reputation would lead the board of management to select the ablest, most skillful and most experienced men for the heads of the service.

It is no uncommon thing to find in hospitals, having no definite medical head, patients suffering from pneumonia and typhoid fever in close proximity with surgical cases. The same hospitals may have separate dressing rooms which are religiously devoted to clean cases and to pus cases, and then all returned to the same ward. It is sometimes amusing to observe the painful

attention given to unimportant things, and the utter neglect of the most important details.

Few subjects in relation to the modern practice of surgery have caused more bitterness of feeling than the management of hospitals.

The building and maintaining of private hospitals involves so much business anxiety and so much diversion of energy, that few surgeons feel willing to assume the cares of such enterprises, and yet there can be but little doubt that the control of a hospital is one of the largest factors in the success of a surgical practice.

I think it may be said that in almost every instance where all doctors in a city have equal rank and equal influence in a hospital, all sink to practically the same level, so far as the local community interest is concerned. It may be said, perhaps, that where one, two or three surgeons develop greater skill, ability and strength than the ranks of the profession, a way will be found whereby the more ideal methods can be reached.

From the observations I have made, it seems to me exceedingly difficult for a surgeon to rise much higher than his hospital environment.

The reputation of a surgeon is largly determined by his contributions to surgical literature. Much of these contributions must be based upon statistics showing the relative merits of different methods of procedure. The profession listen with small patience to observations based on the limited experience of a half dozen cases, and if the experience rises above this, but is based on widely divergent circumstances so far as care and after-treatment is concerned, it may be difficult to determine how much the result may be affected by environments which the surgeon can but imperfectly control.

The statistics of the hospitals themselves are of but little value, for the reason that many of the cases are imperfectly diagnosed and recorded, and the work is done by so many different men of varying degrees of skill,

and by so many different methods and under such differing circumstances.

It has been our privilege to do work in a hospital, where we have had continuous service, and also in hospitals where the service has been intermittent and irregular. In one instance, we have been enabled to trace in infected cases for instance, to the true source of trouble, fix the responsibility and eliminate it. In other instances this has been impossible, and the responsibility has been shifted about and no satisfactory conclusion reached. The conclusion to be reached is, that in all lines of business there must be a concentrated effort to reach the most efficient methods; indeed, this has been found necessary in all lines but medicine. In fact, in medicine, this is seen in the most striking instances of success. Coupled with the highest degree of surgical skill, there goes with it the ability to organize in such a manner as to express in the fullest degree the difference between careless and indifferent methods, and the methods which are the results of thorough discipline and painstaking effort.

It is not intended to create a professional aristocracy by giving certain men special privileges, but merely to set standards which may be attained by all who have the industry and enterprise to reach them. While this may be a hardship to some, it is no more so than we daily witness in every avenue of business.

DISCUSSION.

Dr. R. C. Coffey, Portland, Oregon—With reference to the idea of allowing doctors in a small town to be put on a level with one another, I should say that is probably the only legitimate way in which it can be done; but if there is no man who is above the average practitioner in surgery, who has no more privileges or greater ability, the people in that community are certainly in a sad plight. The only possible way for high class scientific work to be done is for every surgeon to have control of his hospital. I think I would almost as soon quit the practice of medicine as to go into a hos-

pital where there was absolutely no authority and each man was pitted against the other, and have to strive to toady most to the management of the hospital, thus sacrificing one's individuality in the conduct of his affairs. There are two ways of doing this. One is to have a hospital like, for instance, our friends (the Mayos) in Rochester, Minn.; and a very close second to that institution is the one in Oshkosh, Wis., and I wish to say here, I have never seen a better managed institution anywhere than the one there. I do not make any exception. Furthermore, there is no better surgical work done in any hospital than there is there, and that is largely because one man has absolute say in the matter; one man, in a town of forty thousand people, does practically all the surgery in that town and a large portion of the country around. That is really an ideal way.

Another less satisfactory way is to own your own hospital. I happen to be in that class, and while that is a hard way of serving the Lord, I would rather do that than undertake to go in with half dozen men in a hospital each vieing with the other for patronage. I believe I would quit surgery as a specialty before I would go into a hospital in which there was absolutely no authority for the surgical technique. If you put a half dozen men in an institution, you have no authority practically; you must toady to the hospital authorities, otherwise you will not get your part of work or influence. Therefore instead of saying to the surgical nurse: "Things must be so," we are continually telling her she unquestionably has the best technic in the world, and all other doctors are doing the same and the surgeon loses his individuality in this important branch of his work.

Dr. Alexander Hugh Ferguson, Chicago—I have become very liberal in my ideas about hospitals and their conduct. We can classify them under three heads. First the charity hospital, the ward of the city or state, or the community; second, the semi-charity hospital or denominational hospital. Third, the purely private hospital. The idea of having one man responsible for one hospital, or two or three men, is all right, if he or they lived for all time and never needed a successor. But young men grow up who have to become surgeons. While I believe the poor patients of a charity hospital or public hospital ought to be accorded the privilege of having a staff to attend to them, there are, however, a number

of able young physicians who are building up practices on these charity patients, and if they can not treat them at hospitals, they will treat them at their own homes, to the detriment of the patients. There is no reason why a number of men, who have been recognized as bright in college, bright in hospital work and as assistants, should not have the privilege of taking their own cases to public charity hospitals in the city, or town, or country, because they pay their taxes, and these charity patients are their stock in trade with which to build up their reputations There is a great injustice done by public institutions in warding off these young men, and discouraging them continually, the older men saying perhaps something like this: "I am sixty years of age and am still able to do this work." But what about such a man when, perhaps, a year or two later he contracts pneumonia and dies? Proper advantages are not given to the physicians and surgeons who are coming forward in the profession and establishing good reputations. These institutions can be used for post-graduate courses. And those who do not take sufficient interest in charity patients to follow them to the charity wards of public institutions under guidance with the consulting staff are not entitled to patients at all; they are in medicine for the commercial part of it. There is great injustice done by denominational institutions, not merely to physicians but also to the public in many ways. In some institutions in Boston, New York, Chicago and Montreal, it makes no difference what the patient is worth, if he chooses to go into either one of those hospitals, the surgeon in that hospital is compelled to operate upon him or her, as the case may be, for nothing. That is a great injustice to that surgeon. It is a great injustice to the public, because they make paupers out of people who ought to be stimulated to be proud that they are able to pay.

DR. D. N. EISENDRATH, Chicago—The picture drawn by Dr. Ferguson is a rosy one, and, for those who like it, it is an enthusiastic one. I think he is right in his remarks as applied to large cities. But the subject under discussion is the management of hospitals in small cities. It has been my good or bad fortune to observe a number of these hospitals in smaller cities, so that I can endorse every point Dr. Fairchild has made. In the first place, in cities of 25,000 to 30,000 inhabitants,

it is impossible to allow every young practitioner in that city to treat charity cases in the hospitals. Those hospitals need funds, and they have less funds than the larger ones. They need every cent of their funds, and the only way to get them is to charge patients as much as they can afford to pay.

As regards the point of allowing every practitioner in a city of small size to practice in these small hospitals, I know of a number of instances in which, if these practitioners were permitted to operate on appendicitis cases, as they were brought in, the mortality would be practically 100 per cent. I believe that this problem of the management of hospitals in smaller cities must undergo evolution. I believe, in the course of time, from the number of hospitals I have seen, the result will be that those men who operate much to the detriment of the lives of patients will gradually be stricken off the staffs, and that it will be the survival of the fittest, and that those men who can diagnose cases best and operate upon them skillfully will do the major portion of the surgical work.

A NEW METHOD OF ARTHROTOMY FOR OLD DISLOCATIONS OF THE SHOULDER.

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I had always disliked the operation for old unreduced dislocations of the humerus. It seemed to me to contain elements of risk and uncertainty, and to be bloody and unpleasant to perform.

Since adopting my transmuscular incision, I find the operation comparatively safe and rapid.

That surgeons and orthopedists look askance at shoulder joint arthrotomy by the old methods, I had evidence, when I submitted one of my recent cases before operating to Professor Hoffa, of Berlin. Although he was doing the bloody reduction on numerous hip cases here, he shrank from tackling this old shoulder dislocation, which was in a very fat subject, and advised letting it alone or resecting the joint.

On the other hand, many serious and fatal accidents have been reported in the efforts at "bloodless" reduction, so that "bloodless surgery," so far as concerns the shoulder, has a gory record of causing about fifty recorded cases of hemorrhage, mostly fatal. As these cases are well-known in the literature, I will not dwell on them.

Frank Hamilton, in 1884, collated 24 cases of axillary vessels torn in reducing old shoulder dislocations, of which 15 died. These were in the practice of the best surgeons here and abroad.

Thus J. C. Warren of Boston (*Am. Jour. Med. Sci.*, xi, 1846), reports large aneurysmal tumor from efforts at reduction. Subclavian tied, with recovery.

Blackman of Cincinnati had fatal case.

Desault (*Jour. de Chir.*, vol. iv, p. 301) reports two cases where such efforts caused "tumors aerriennes." Both fatal.

Peletan (*Chir. Clin.*, vol. ii, p. 951) reports 2 cases. Verdoc (*Op. Chir.*, 1893, p. 559) reports one fatal case. Malgaigne (Ed., 1855, p. 150) had a case of axillary artery ruptured in reducing, with recovery. Petet, Dupuytren, Nélaton, and Bell (reported by Hamilton) each had cases.

Delpech (Mem. de Leuxationes, 1827) had artery tear during reduction, and death ensued at once.

Gibson reports two fatal cases, one his own, and one that of David of Rouen. Another Rouen surgeon, Leudet, had one case—fatal (Gibson's Surgery, p. 824.)

Callender (*St. Barth. Hosp. Rept.*, 1866) had one fatal case. Sir Joseph Lister (*Med. Times*, Feb., 1876) had one case. Frorich (quoted by Malgaigne) tore axillary vein in old shoulder dislocation, patient dying in an hour and a half.

Agnew (*Phil. Med. Times*, Aug. 16, 1873) ruptured the vein in a six weeks' old dislocation. A large tumor formed over chest. Under compresses patient recovered. No reduction of dislocation secured.

Platner (see Malgaigne's list) ruptured both vein and artery. Sac burst later, with death.

Chas. Bell (*Phil. Med. Times*, 1873) ruptured both vessels and amputation had to be done.

H. B. Sands, in a seven weeks' old dislocation (*Med. Gaz.*, 1880) had large tumor form in axilla. Recovery followed. No reduction of dislocation.

Lisfranc had a case die of "cerebral congestion" after reduction.

Guerin (see Malgaigne, p. 151) tore the entire arm

from trunk in an aged woman in trying to reduce shoulder.

Hutchinson (*Lond. Hosp. Rept.*, vii) and Courtright, of Ohio (*Cincinnati Lancet and Observer,* January 1877) had cases of sloughing and suppuration following efforts at reduction. Both fatal.

Stephen Smith had one, and Malgaigne four, cases of neck of humerus fracturing in trying to reduce old dislocations. This is particularly dangerous to the vessels.

In all, Hamilton (Fractures and Dislocations, 1884) found:

	Cases.
Axillary artery ruptured	18
Axillary vein ruptured	2
Artery and vein	2
Unknown vessels	2
Total	24
Deaths	15

A St. Bartholomew Hospital case (*Lond. Lancet,* July 6, 1878) was torn, not only through vessels, but axilla was torn open in efforts at reduction. The tissues were found "in a state of degeneration."

Willard (*Phil. Med. Times,* Aug. 16, 1876) collates 19 cases, with 12 deaths.

Dupuytren found swelling in axilla after reduction of old shoulder dislocation. This was taken for an abcess and opened. Died of hemorrhage.

R. Adams (Agnew's Surgery) had a similar case; tied the subclavian, and got recovery.

Holmes and Callender each had cases of torn artery. Stimson brought the number of cases of ruptured axillary artery up to 44, with a mortality of 70 per cent.

Prochaska of Vienna reported an extraordinary instance of damage and displacement of head of humerus. This was thrust between the ribs and held firmly there, displacing pleura. All efforts at reduction failed, and patient lived many years, and died from other causes. Specimen now in museum.

Injuries of the brachial plexus are reported by Lecarrey, Lenoir, Malgaigne and Flaubert. The last mentioned, in trying to reduce an old dislocation, tore out the four roots of the brachial plexus from the spinal cord, causing death in eighteen days.

In recent years Paget, Kőrte, Schoch, and others have added cases to this series, so that now more than 50 are on record. Of these, 38 were of the axillary artery, according to Körte's summary. The majority of these accidents ended fatally, and most of the remainder suffered amputation.

Very good summaries have appeared in recent years by American and English surgeons, notably those of Willard, Souchon, Keetley, and an especially good report of seven operations by Jonas of Omaha, who seems to anticipate my idea somewhat by advising some cutting of the pectoralis muscle. Willard's incision is at the pectoro-deltoid line. He also advocated splitting the pectoralis.

Hotchkiss (*Ann. Surg.* April, 1904) reports two successful cases.

Keetley (*Lancet,* Jan. 23, 1904) quoted J. Finckh, from Brun's Tubingen Clinic; in all 100 cases of old, unreduced dislocation. Of these 23 were left unreduced. of the remainder, two-thirds were successfully reduced by operation. Keetley claims the first case of successful arthrotomy in 1890.

Rearink reports a total of 44 cases of the operation by various surgeons.

J. Dollinger, in Budapest ("Anatomische Hindernesse and Meine Methode," *Deutsche Zeit für Chir.,* lxvi, 319, 1902), treated 19 cases in 5 years; six cases were treated by a bloodless method. (In 2 cases the head of the bone broke off and remained unreduced.) Of the remaining 13 cases, 3 had the bone resected. Ten open arthrotomies were performed by Dollinger's method, all successful. The incision is between the deltoid and pectoralis major. Dollinger pulls the pectoralis minor up

and the major down. He finds the supra- and infra-spinatus, and teres minor and coraco-brachialis in the way but thinks the sub-scapularis is the main obstacle to reduction. When he cuts this, reduction by Kocher's rotation is easy, like a recent case. He thinks Kocher and others wrong in believing the altered ligaments most at fault. It is the altered and sclerosed subscapular muscle which he thinks most in the way.

My own observation leads me to look upon ligamentous and scar issue as the chief obstacle rather than any one muscle.

It is entirely clear that surgeons are giving up the bloodless method, and that few cases of rupture of the vessels will now be heard of. I have never met this accident personally, but am able to add two cases. Dr. A. H. Ferguson informs me that he was called to see an elderly man who had earlier sustained a dislocation of the shoulder upon which efforts at reduction had been attempted. The appearance of a pulsating tumor in the axillary region alarmed the physicians who were attempting reduction, and Dr. Ferguson was hastily summoned. He found a traumatic aneurysm of the axillary artery, the patient dying in a few moments after his arrival.

Dr. A. Ochsner also informs me of a similar case in a clinic of the late Charles T. Parkes. During efforts at reduction of an old dislocation in the Rush College Clinic, the vessels were torn, a sudden hematoma appeared, and the patient died of shock, after ligation of the subclavian.

It may seem strange that a larger percentage of these could not have been saved, inasmuch as ligating the subclavian artery does not of itself give a high death rate. We find from Finckh's statistics of Professor Brun's clinic, and other sources, that only three cases of gangrene occurred in 90 ligations of this vessel. It must be remembered, however. that most of these accidents were unexpected, and that dangerous loss of blood had

time to occur before relief could be obtained. We thus see the triumph of "bloodless surgery" in first causing the hemorhage, and then in attempting to cure it by compresses.

These facts are so well known as to be commonplace. Their mere recital is a demonstration that new methods are needed, or that old methods should be abandoned. No careful surgeon now practices or advocates using any but the mildest force in the old shoulder cases, the direct antithesis of what is done in the hip joint, for there we see an appalling force employed, with no other bad result than occasionally fracturing the bone.

Of course, some old shoulder cases are reducible by manipulation. I have had four months' case surprise me by slipping into its socket as easily as a recent one. This is exceptional. The majority of cases of ancient shoulder dislocation will fail of reduction by bloodless methods, and present the choice of three courses of management: 1. Leaving unreduced; 2. resecting the joint or head of humerus; 3. arthrotomy or reduction by cutting operation.

1. The first, or *laissez faire,* management is suitable to very few of these cases. The majority have such pain or paralysis, from pressure of the head on the brachial plexus, that some interference is demanded.

2. Resecting the head gets rid of this pressure, and is a rational operation. The functional result, with a false joint, is often surprisingly good. It would be unfair not to mention that this operation has its risks. While usually classed as of less severity than open reduction, it may not really be safer. It certainly does involve more destruction of tissue, but is, of course, a much more simplified and straightforward operation for the man of limited experience to undertake. Yet even experienced operators do not always find resection easy in old dislocations, because the head is no longer capable of being thrust out through the incision, nor are the capsular ligaments so easy to find and cut. Thus Annandale

reported a six weeks' dislocation, with great pressure on the nerves. After efforts at reduction had failed, he cut down and found the head adherent to the axillary artery, which was freed after some trouble. The head was also adherent to the ribs, and was cut away in fragments. The circumflex artery was accidentally torn, and the subclavian had to be ligated, causing gangrene of the arm and death in three days. As a substitute for open resection Dieffenbach, Molliere and Pollailon advocated subcutaneous section of resisting bands to assist reduction.

3. We come now to arthrotomy, the ideal replacement of the bone in its socket by open incision. This can not be said to be an accepted operation in the sense that all authorities commend it. Rather the reverse is true, that most of them ignore or speak guardedly of its merits. Still Sir J. Lister, Langenbuch, Knapp, Smital, Rearink, Kozlowski, Ollier, Kőrte and Schoch early worked out a technique, so that we had it fairly systematized, although no one operator has reported a large series of cases. Later the work of Dollinger, Keetley, Jonas, Rearink and others has greatly improved our methods. It still ranks among the difficult and undefined methods, partly from the old dread of opening joints, partly because of the probable entanglement of the great vessels, and partly, I am convinced, because a proper exposure and a large enough field was not obtained by any of the older incisions to do safe and rapid work. Ollier's and Lister's incisions through or near the border of the deltoid give good access to the joint, or would do so if the joint were normal. They are, however, much better adapted to get at the empty socket than the head in its false position. In fact, through such incisions the head must be felt rather than seen, and the vessels detached from it, if adherent, by blunt dissection, partly out of sight. That is, if the head has gone over against the chest wall, the lateral border of the incision can with difficulty be retracted enough to uncover it.

The tissues bleed freely during the stage of loosening the head of the bone from its false adhesions, and I know of no operation where small or badly placed incisions cause more trouble.

In four cases in which I used the Ollier incision, the operation took at least one hour, largely because the persistent venous oozing obscured the field, and made it quite difficult to see, and detach the great vessels and nerves.

I became satisfied that it was dangerous as well as difficult to deal with the vessels, except with the parts fully exposed to view. My next operation was planned so as to approach the bone from the side of the vessels, rather than from the side of the socket. This involved practically the same conditions found in surgery of the breast tumors. What was obviously needed was wide open dissection of the axilla by removal of its anterior wall, or, in other words, the pectoralis major muscle needed to be cut off from the humerus temporarily.

We have all noticed the free access we gain to the parts when we cut this muscle in the radical breast removal, the coracoid process, humerus and clavicle, as well as the brachial plexus and great vessels, being exposed for a long distance. I know of no operation which so much resembles an anatomical dissection in the extent of structures it lays bare, nor any in which it is so easily done with a few strokes of the knife. When the dislocated humerus takes the anterior and inward position, as nearly all of them do, the head is really in the axilla. Such incisions as Lister's, while just suited to the operation of resection, take no account of the new position of the head. They do, it is true, give greater facility than mine for clearing out the socket and dissecting the capsular ligament, but this is less vitally important than the question of saving the axillary vessels and nerves, which I make the chief aim.

The older incision also is more conservative, being made by separating muscular fibers, whereas I cut them

transversely and have more trouble in reuniting them. Admitting this, I am sure it is worth the sacrifice, in the ease and safety it confers on all the other steps of the operation.

The vessels once being saved, and drawn away out of danger, the replacing of the bony parts is not so difficult a problem. Some cutting of the capsule, now altered from a tubular process to a flattened band, has been required in all my cases. The rotation methods of Schweiniger and Kocher are so powerful that fibers of any strength and even the bony parts can easily be ruptured. (See Dollinger's cases above.) Combining this rotation, which rapidly loosens the head, with a little cutting of tight bands and manipulation of the scapula, no great trouble or delay occurred in replacing the bone in my last cases. In the earlier ones a great deal of strength was wasted and time lost in efforts at traction without enough preliminary rotation and cutting of fibers. I employed the "Jarvis adjuster" in one such case, and found it a valuable aid, but not equal to rotation as a means of breaking adhesions.

The steps of this arthrotomy as I now practice it are:

1. Incision from clavicle downward across front of shoulder into axilla. The cut is large—50 per cent. longer than by the older methods.

2. Section of the pectoralis major near its insertion, leaving about 1 centimeter attached to bone. This muscle being cut transversely is laid over with the skin flap exposing the axillary vein and brachial plexus. The pectoralis minor is not cut unless the head of humerus and vessels have been forced under it.

3. Careful examination of the vessels, if they cross the tuberosity or head of the humerus, is now made. The artery can not be seen except by drawing aside the vein. On account of this deep position it is more often involved in the adhesions, and has been the vessel usually torn. Great care and plenty of time are needed to separate these vessels when they or their large branches,

e. g., subscapular or circumflex, are found adherent. No efforts at reduction should be made until the vessels and large nerve trunks are isolated and pulled aside. Some of the reported injuries of the vessels are thought to be due to projecting fragments or spicula on the humerus.

4. The forearm should now be flexed on the arm, and an assistant should rotate and make traction, when the fibers of the adhesions will be seen and heard to tear gradually, so that the range of motion increases. In one case I had Dr. Ridlon to attend to this part of the work. It should be entrusted to some one of experience and judgment in joint work, as everything depends on using a sufficient, but not a dangerous, amount of force. The operator, while this is going on, should clear the socket and cut and nick such bands as refuse to yield after stretching. The head and glenoid cavity soon approach each other, the operator tilting the scapula toward the head and giving directions simultaneously as to flexing, extending, abducting and rotating the limb, as he sees fit. At the last moment the head is apt to take a subglenoid position and refuse to ride over the lower rim of the socket. Before cutting the ligaments more widely as one is tempted to do, I have found that if a blunt hook or retractor be made to pull the upper end of the humerus straight away from the body, the head can sometimes be dragged over the lip of the socket. I find that Keetley (*Lancet,* Jan. 23, 1904) advises using hooks on both humerus and scapula. This may be better than merely tilting the shoulder-blade with the hands, but I have not tested it. Once in place, it can usually be held, although the capsular ligament is far from being intact; sometimes, in fact, has lost its identity in a mass of scar tissue. As Dollinger well puts it, "The lumen of the capsule is narrowed or obliterated." The arm should now be kept against the body until bandages are on.

5. The pectoralis major and, if cut, the minor, should now be reunited by the Harris tension suture method, and the skin closed with separate suture. Drainage should rarely be dispensed with. This operation is invariably a bloody one, if the dislocation is of long standing, and the adhensions firm. Good drainage for a few days prevents infection, which can easily take place with large joint surfaces bathed in wound secretion.

CONCLUSIONS.

1. It must be considered established that great force is never justifiable in old shoulder dislocations.

2. Few cases can be left unreduced, on account of pain and pressure symptoms on brachial plexus.

3. Resection is satisfactory, but not ideal or wholly safe.

4. Arthrotomy by the old incisions is tedious and never has been widely practiced.

5. Arthrotomy by the author's method is simplified and made quicker, as well as safer. It would possibly be as safe as resection, and much more ideal in result.

DISCUSSION.

Dr. Alexander Hugh Ferguson, Chicago—I rise to commend this procedure. I adopted something similar, without cutting the muscles so extensively, but only in one case. We realize how important a surgical procedure this is, when we see and feel everything in connection with the displaced head, especially the vessels and nerves. I remember some years ago being called in a hurry to see a clergyman, who had a chronic dislocation of the shoulder joint. Attempts were made by three local physicians to reduce it, and they ruptured the axillary artery. Before I got there, the man died of hemorrhage. There is a well recognized danger in trying to reduce these old dislocations, and should not only be approached with caution, but with fear and trembling. If an old dislocation can not be reduced with the ordinary amount of force and manipulation, we should cut down on the bone, as it is a safer and more surgical procedure.

Dr. C. E. Ruth, Keokuk, Iowa—I have been compelled to open but one shoulder joint, and then I was

not forced to section so extensively as Dr. Andrews referred to in his case. This was a case of dislocation of the shoulder joint of nine months' standing. I have reduced these dislocations after three months without a great deal of difficulty. When I say difficulty, I mean that we used a great deal of force but secured reduction without operating complications; but I was very careful, and operated, as Dr. Ferguson says, "with fear and trembling." I am always careful not to raise the arm at more than a right angle with the trunk. To aid the head of the bone in gliding over the ridge of the glenoid cavity, the method I used was to pass a band around the thorax so as to grasp the lower end or the axillary border of the scapula, and then draw it across the opposite shoulder; this was used to make counter-traction so as to hold the lower border of the glenoid cavity and prevent the scapula from tipping up, as it inclined to do, just as the arm is raised a little from the thorax, and it aided me in carrying the head over that margin.

I appreciate what has been said with reference to the necessity of making haste slowly in these cases, and while steady traction is being made, that rotation be kept up by using the forearm as a lever in rotation, and gradually as the adhesions yield, we get more and more space.

I was compelled to open through the capsular ligament in the case of nine months' standing and to section the subscapularis.

Dr. Donald Macrae, Council Bluffs, Iowa—I wish to relate briefly a case in connection with this subject, as it seems to me to be pertinent in showing the necessity of cutting down early on these cases of dislocation of the shoulder joint. The case came under my observation a short time ago, in which, after three months had elapsed from the time a subcoracoid dislocation occurred, I cut down, and after cutting the head of the biceps and the coracobrachialis, I succeeded in getting it back into the glenoid cavity. The pain and marked edema of the arm still continued. The operation was quite extensive, and it was necessary to resort to drainage. In connection with rubber drainage, I wrapped the tubes with gauze, as is my custom in some cases. Later, the physician in charge removed the tubes, but allowed the gauze to remain. To make a long story short, there was a discharging sinus; and the patient

complained of pain in the same region she had during the dislocation. Dr. Davis can tell you something about the after-treatment in this case. I did not see the patient again. I understand that Dr. Jonas got the case next. He removed the pieces of gauze, but the pain still continued, and some months after this Dr. Davis got hold of the case. I believe he cut down and removed the head of the bone. The pain continued, and the patient finally died from exhaustion. The patient was a woman, 60 years of age, and weighed 200 pounds.

There are other injuries around the shoulder joint, especially in connection with the brachial plexus, that are serious, even though the joint is replaced comparatively at a late date. Therefore, the necessity of early correction of the condition on account of the severe pathologic conditions which take place in the surrounding structures in consequence of bone being out.

Dr. Andrews: (closing discussion)—I think the list of 53 cases of rupture of the vessels in these dislocations of the shoulder joint is a small proportion of those that have actually occurred. All the bad cases are not reported. For instance, to-day I learned of two more from members here, which can be added to the list. Dr. Ferguson has just reported one case, in which the patient died. A gentleman, who has just left the room, Dr. Ochsner, told me that Dr. Charles T. Parkes, of Chicago, in an effort at reduction of a dislocation of the shoulder joint, ruptured the vessels in the axilla, causing aneurism, from which the patient died on the table.

CURETTAGE AND PUERPERAL SEPSIS.

C. E. RUTH, M.D.

KEOKUK, IOWA.

Puerperal sepsis in abortion and labor at term undoubtedly always existed, though I am convinced that through our pioneer population it was rare compared with the percentage of deliveries. It became a fearful scourge when in the more populous districts the dirty midwife and almost equally dirty doctor attended most of the cases. With the advent of criminal abortion by instrumentation self-induced or caused by a professional abortionist, it became frightfully common, and though a large number died, a larger number were permanently invalided.

While many abortions have occurred and will occur from cervical laceration, weakness, subinvolution, falls, etc., I am convinced that fatal sepsis was very rare when digital and instrumental genital manipulations and examinations were not done. In other words, spontaneous, unattended abortions and labors at term were almost never fatal from sepsis. Leopold's report of 919 cases not examined with only two cases of possible auto-infection gives great strength to this view. True, some of these cases flooded to the point of almost complete exsanguination and many of them carried putrid placental tissues and membranes for many weeks, occasionally were quite sick with fever of a moderate degree and had an occasional slight chill, but they did not die. I have, in my earlier practice, seen this condition accompanied by a putrid odor that made it almost impossible to remain in the same room with the patient, and yet they recovered.

Why did they not die? Because they were suffering from a toxic influence due to saphrophytic germs which could only live and propagate in dead tissue and whose toxins gained entrance into the circulation and produced constitutional symptoms only when drainage was interfered with and they were forced into the circulation; provided with free drainage, these cases were always immediately relieved whether placental tissues, membranes and detached necrotic desiua were removed or not.

The profession presumed that the symptoms were produced by the retention of the secudines and began their removal by finger and curette, and if it were done early, very gently, and no additional and more dangerous germs were introduced, the patient recovered at once. But many of the cases became suddenly very much worse, curettement was repeated more vigorously under the supposition that the former effort was not sufficiently thorough. In many cases, this resulted in a great increase in the intensity of all the symptoms and speedy death. In many cases, postmortem proved the uterus to be free of all secundines and with nothing to show the cause of death except evidences of inflammation of the uterus, sometimes some edema and softening of the uterus, and peri-uterine tissues. In other cases, the uterus was extensively softened and numerous abscesses had formed in the uterine muscularis or peri-uterine structures. In the chronic cases, extensive peritoneal adhesions had taken place and in many cases of the very fulminant kind, bloody serum was found in the peritoneum with but slight changes in the uterus or peri-uterine tissues. The cause in each case was held to be due to too late removal of the placenta and membranes. Later, the suspicion began to overtake the profession that manual and instrumental manipulations were responsible for the introduction of germs which were more virulent than saprophytes and that could pass through

and multiply in living tissues as well as circulate in the blood, destroying the vitality of tissues where massed together, producing abscesses when enough time had elapsed; in other cases, multiplying in the circulatory system so rapidly as to cause death without pronounced microscopic local changes.

We had not then learned, in fact are just learning, how to cleanse our hands, and when they were cleansed they were reinfected on the way to the interior of the uterus by bedding, foul labia, hairs on the vulva, etc.

The vagina was not known to be its own sterilizer if it had a chance to use its own physiologic laboratory, but we were taking it at a disadvantage and planting our cultures where they got in their work to the greatest danger to the patient.

In the best maternity hospitals where preparation, position, attendance and dressing can be perfectly controlled, puerperal sepsis has been almost entirely eliminated. While this is true of perfectly ideal surroundings, *some* infection *will* sometimes occur, but more especially where the majority of the cases are not and can not be placed in ideal surroundings, but every effort should be made to approximate the ideal as nearly as possible.

If the infection be saprophytic, we may expect foul odor in which dead tissues in the interior of the uterus, namely, placental tissues, membranous and detached desidua are attacked. This must of necessity be local and if the infection remains saprophytic, it will not endanger life and the temperature will not likely go very high. Dead tissues, that is, necrotic fetus, may remain in the uterus indefinitely without infection.

The next degree of severity of infection will result from anærobic bacilli, at the present time the least perfectly understood including the *Bacillus aerogenes capsulatus* and the bacilli of malignant edema. While saprophytic bacterial infection must attack and live on dead

tissues, being unable to invade living tissues, it will not markedly soften or disintegrate the uterine structure. The anærobic bacilli may be, in fact are, able to penetrate somewhat into the living tissues and one or two deaths have been attributed to infection of this nature, while streptococcus, staphylococcus and colon bacillus can invade any tissue. The bacilli of diphtheria and typhoid may also invade living tissues. Infection with streptococcus is especially virulent but is sometimes mixed with staphylococcus. Examinations of patients in maternity hospitals by Professor Edgar revealed the fact that the upper part of the vagina showed no pyogenic germs. This was true up to the entroitus except where germs had been introduced less than forty-eight hours. It was found that some pyogenic germs would live four days in the upper vaginal secretions, but in 40 per cent. of the cases examined by the same author in the same emergency and maternity hospitals, the vulvar canal below the entroitus contained pyogenic germs. It therefore becomes necessary that physicians should not only as thoroughly as possible sterilize their hands, but that the external genitalia should also be thoroughly cleaned up to and including the vulvar entroitus before anything is carried high up in the vagina because of the danger of contamination by pyogenic bacteria from fingers or instruments carried into the upper part of the vagina. If this be done by every physician with every possible care, there yet remains the possibility of infection by sexual indulgence up to and even including the commencement of labor. If this takes place, there is no question that in some cases it will be the cause of infection in cases otherwise treated by skillful and painstaking obstetricians.

When we have eliminated the two principal pyogenic germs there yet remains to be considered the greatest scourge and most resistent of all, the diplococcus of gonorrhea, so that, in spite of all care, we will occasionally,

because of germs in the vaginal canal, viable at the time of labor or introduced by the hand of the obstetrician or by his instruments, come into contact with various infection agencies and we must be prepared to deal with them intelligently, and if possible exclude the production of uterine and peri-uterine phlebitis, puerperal metastic pyemia, septic pneumonia, septic endocarditis, septic arthritis, phlegmasia alba dolens, pelvic cellulitis, and pelvic peritonitis or perimetritis, as well as the milder saprophytic intoxication involving only dead tissues within the uterus. This form should be called sapremic intoxication, not infection.

Prevention must always be the most important treatment and must always include hygienic asepsis of the patient and physician and great care in examination. No instrumentation in any variety of puerperal sepsis should be considered which denudes the uterine mucosa and opens up tissues not in any sense protected from septic infection, the utmost gentleness being used to avoid any possibility of puncturing the softened or disintegrated uterine wall. The curette, I believe, in such cases should never be used, certainly not a small or sharp one and then only in the least serious of these cases, namely, saprophytic intoxication. I have for many years been quite satisfied with a placental detacher of my own devising which answers every purpose with the minimum danger of perforation. The use of antipyretics, which depress the heart action and interfere with the oxygenizing process of the blood, can scarcely ever be indicated, sponging and cold packs when the temperature runs dangerously high, being much safer. Cool or cold water bottles are best of all. The use of antistreptococcus serum, while it acts like magic in some cases, will prove entirely worthless in others, can do no harm and is therefore always indicated.

Streptococcic and staphylococcic are the most serious of puerperal infections, as they have, on the manifesta-

tion of symptoms, passed beyond all possible reach of removal by any form of curettage. While curettement can do no good it may do much harm in disseminating infection and in uterine perforation. This later element is important because I have known cases in which perforation of the uterus was done by a man of several years' experience and above the average in ability; by another of very large experience and national reputation, noted for care in operations and original research, and by five men of international reputation, one of whom had previously declared that the penetration of the uterus with the curette was a crime, and at his next operation of this kind put the curette through the uterine wall. Within the last two years I have operated on three cases of puerperal sepsis illustrating the dangers of curettage. The first was five weeks after delivery, in which the uterine wall was honeycombed in every direction on one side and I could put my finger through without meeting with marked resistance. In this case I did a complete hysterectomy and lost my patient in three days. A few weeks later, I operated on a second case and found that I could run my finger through the uterus with great ease. In this case I removed the ednexa on the side that was most damaged and passed drainage tubes through the posterior wall of the vagina, surrounding them with an abundance of gauze. Abscesses in the uterine tissue were freely drained into the vagina through the cervix or by way of gauze and the tube drain through Douglas' cul-de-sac. This patient recovered without special incident and remains well at the present time, two years after the operation. I believed it safer in this case to provide thorough drainage and leave the uterus and adnexa badly damaged, than to run the risk of further spread of septic infection and lessened resistance of my patient by a heavier operation.

In my third case, I operated in almost the identical manner of the second case except that the operation was

done in stages, owing to the critical condition of the patient. Evacuation was done first through the uterus and vagina by dilating the vagina, cervix and pus tracts in the uterine wall. Three weeks later I made a suprapubic incision and drained through the posterior vaginal vault, removing the right adnexa, which was suppurating. The uterus in this case, as in the previous ones, was readily punctured by the finger. Recovery was tedious, but is now complete after eight months.

In view of the history of these cases and the conditions found at the time of operation. I have realized with greater force than ever before what I previously believed, that curettage in such cases exposes the patient to greater dangers and removes no risk whatever.

Since writing the above, Mrs. R. F. was examined by me at my office May 6, 1905, and gave the following history:

Four months previously she had an abortion and was septic afterward, with ill health up to date. Examination revealed cervix and perineum laceration; large, rather boggy, sub-involuted uterus with marked immobility; tenderness so pronounced as to make it impossible to outline the mass of inflammatory deposits behind the uterus.

She was prepared for perineal and abdominal operations. The cervix was dilated, the wall of the uterus was curetted and, on attempt to carefully curette the fundus, I perforated the uterus, entering the peritoneal cavity with a Rinsing curette discharging fluid.

No further curettement was done; the cervix and perineum were repaired, the abdominal cavity was opened and the perforation was found to be located in the anterior portion of the fundus.

On the right side, I found a very large pyosalpinx with suppurating ovarian cyst the size of a lemon; on the left side, was a pyosalpinx with ovarian hematoma the size of an orange.

With such a wreckage of the adnexia, there was nothing left to consider but a complete hysterectomy; though it taxed the patient pretty severely recovery was without incident.

This will add another to the list of accidents in currettement of septic uteri. I had hoped not to make such a report myself but must do it in honesty to the profession at large and as a warning, which is a part of the purpose of writing this paper in the first place, against the use of the curette in septic cases.

DISCUSSION.

DR. ARCHIBALD MACLAREN, St. Paul, Minn.—Dr. Ruth is entirely correct in his opinion in regard to the use of the curette. The safest instrument to use is the ordinary sponge placental forceps, which almost every one uses or should use in abdominal surgery. At the Charity Service in St. Paul, where I saw a number of cases of abortion and puerperal cases, there was elevation of temperature in many of them after the curette had been used. In a large number of cases there was retained placenta. I do not think there can be any question but what a good many of apparently normal cases of delivery have small pieces of placenta left behind when the placenta is carefully examined by a competent man. Three competent men sent patients to the hospital with pieces of placenta left behind, all of them infected. Drainage of the cul-de-sac is unquestionably the procedure to follow in these cases, as well as drainage of the uterus. The uterus should often be drained with a large-sized rubber tube, after it has been dilated and examined with the probang or blunt placental forceps, the cervix kept open, so that drainage can be thorough. A large-sized rubber tube should be stitched in and held there for three or four days, which will certainly help in the recovery of the patient .

OUR DUTY TO THE UNITED STATES ARMY AND ITS MEDICAL CORPS.

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COUNCIL BLUFFS, IOWA.

The stories told of the horrors of our military camps within the confines of the United States during the Spanish war would seem incredible were it not for the vivid picture of the poor, emaciated, jaundiced and almost hopeless faces that overcrowded the so-called hospitals in Tampa, Chattanooga, Alger, Montauk Point and Camp Merritt in San Francisco.

Fourteen hundred deaths from disease for every 100 killed by guns is the record of the Spanish-American war, the actual severe hostilities of which lasted but six weeks. How many thousand perfect specimens of our American manhood have been wrecked by the effects of this same short campaign, God only knows. Was the medical officer of the service to blame? No; but he was held guilty by the people generally and the parents and friends at the home of the victim in particular.

Those of us here who served in the army at that time recall the pomp and display of the cavalry, infantry and artillery as they drilled for hours over the hills and dales. We marveled at the improvement in the marksmanship of the man behind the gun, and wondered where he procured his ammunition. Not so with the medical department. Sterilizers were unknown and requisitions for these, as well as many other necessary articles for the prevention of diseases, were either lost or pigeon-holed.

At the beginning of the war and for months there-

after the privates of the hospital corps were detailed men from the companies, whose commanders were glad of the opportunity to rid their commands of these most shiftless and worthless men to act as nurses for the poor sick soldiers.

Time and again has the writer purchased catgut, silk, needles, and paid for same out of his own pocket while in charge of the surgical wards at the general hospital in Presidio, San Francisco, not to mention the fact that the instruments in use were few and of the old wooden handle variety. For months men were put to bed on wire springs without a mattress while their own clothes were used to keep them warm.

And all this within one hour's electric car ride from the heart of one of our greatest metropolitan cities. This is an old, old story, and should have been buried by the Republic with the soldier dead of the Spanish-American war in Camps Alger and Merritt. This is not the case, however, or my paper would never have been written. I do not blame any one for the conditions during our war with Spain, I ascribe them to the general lack of preparations due to a long time of peace and a conceited public, scouting the idea that any nation would dare cross swords with it. These, coupled with the actions of the public politician who follows the howl of those who are opposed to sane safeguards, were *responsible, are responsible, and will be responsible unless the American citizen rises up before and not after another blunder is made.*

The Dodge Commission, which was appointed by President McKinley to investigate the conduct of the war with Spain, and to suggest remedies for defects found to exist, stated that one of the principal defects under which the Medical Department labored was a lack of trained surgeons of the regular Medical Corps. An increase in this number was recommended. This recommendation, however, was lost sight of in the reorganiza-

tion of Feb. 2, 1901, and the Surgeon-General's recommendation was ignored, so that the proportion of medical officers to the authorized strength of the army was not increased, but greatly decreased.

This proportion was:

	Per cent.
At the beginning of the Civil war	0.69
At the beginning of the Spanish war	0.77
At present	0.32

The authorized strength of the Army was increased 300 per cent., but the Medical Corps only 67 per cent., and this increase was mainly confined to the lower grades, which has destroyed the prospect for promotion, as follows:

Bill to increase the efficiency of the Medical Department of the U. S. Army. (H. R. 13998.)

Colonels, 6 to 8	33 per cent.
Lieutenant Colonels, 10 to 12	20 per cent.
Majors, 50 to 60	20 per cent.
Captain's Lieuts., 125 to 240	92 per cent.

The substitution of regular officers for contract surgeons is absolutely necessary for the efficiency of the Medical Department.

The contract surgeons now in the service are very much dissatisfied with their status. "Being civilians they have not the official standing of the commissioned officers, and can, as has been recently decided, command not even the members of the Hospital Corps. Their professional competence has not been taken by rigid examination, as is the case with regular officials." "They are much more costly to the Government on account of the continual changes in the personnel." "In five years since the Spanish war there have been over 1,600 contract surgeons appointed and over 1,500 discharged." "The cost of traveling expenses incident to these changes has been very great, and to add to this the loss by ignorance of their duties, lack of administrative experience, loss of property by inexperience in accountability, errors in records and reports by which the interests of the Government are safeguarded in pen-

sion cases, and the contract surgeon will be seen to be a far from economical substitute for the regular officer." "His pay besides is two hundred dollars a year greater than that of the lieutenant of the regular Medical Corps." (The bill to increase the efficiency of the Medical Department of the U. S. Army. H. R. 13998).

To overcome these defects and to make the Medical Department of the Army more efficient, a bill has been prepared by the Surgeon-General which has received the endorsement of the General Staff, of ex-Secretary Root and the present Secretary of War, and of the Military Committee of the Senate. It is now in the hands of the Military Committee of the House of Representatives. Its passage depends upon the voice of the chairman of that committee, Hon. J. A. T. Hull, member of Congress from the 7th District of Iowa.

I am informed that while the member from Iowa recognizes that a more efficient corps is necessary, he feels that the bill asks for too much; his most strenuous objection is to the increase in the grades of Colonel and Lieutenant-Colonel.

In a nutshell, the bill presented by the Surgeon-General is as follows:

SEC. 2.—That the Medical Corps should consist of 16 Colonels, 24 Lieutenant-Colonels, 110 Majors and 300 Captains or First Lieutenants.

SEC. 7.—That for the purpose of securing a reserve corps of medical officers, available for military service, its President of the United States is authorized to issue commissions as First Lieutenant therein to such graduates of reputable schools of medical cities of the United States who shall, from time to time, upon examination to be prescribed by the Secretary of War, be found physically, mentally and morally qualified to hold such commission, the persons so commissioned to constitute and be known as the Medical Reserve Corps.

In order to show the absurd relative positions of our Medical Department compared to that of other countries,

the following table tells the story. Field service regulations for a division numbering approximately twenty thousand:

	Beds.	Officers.	Men.
United States Army	216	8	98
Germany	1,200	54	282
France	400	44	560
Great Britain	300	15	201
Russia	840	36	428
Japan	1,200	48	648

Again: The field service regulations for divisional ambulance establishment:

	Officers.	Non.-com. officers.	Men.
United States	6	16	122
Germany	14	16	230
France	14	25	192
Great Britain	8	32	170
Japan	13	61	342
Russia	6	—	285

Further argument seems unnecessary at this time. That Japan, with its largest number of men and officers per division, perfectly trained in the smallest detail on the work pertaining to the Medical Department, is superior to any medical auxilliary and any fighting machine in the world to-day is the unanimous opinion of those who have recently returned from that field. To show the utter lack of understanding of our Government in this connection, and the importance of thorough discussion of subjects pretaining to the welfare of our soldier boys, the following is an example: Dr. Louis L. Seaman, in his address on his observations in Manchuria before the last meeting of the Military Surgeons in St. Louis, after discussing the three great lessons to be learned from the Japanese war, namely, "The Medical, the Commissary and Tranport Department," etc., says: "The Japanese authorities permitted our Government to send five military attaches to accompany their army in the field. Was a surgeon, or a quartermaster, or a commissary officer detailed? No; they represented the life-saving and life-preserving departments and were omitted. The killing departments get the appointments,

the cavalry, ordinance, infantry, etc. and to-day Japanese officers are laughing in their sleeves at our senseless failure to have representatives of what they consider their three vital points, whilst the only weak, comparatively burlesque feature of their army, namely, cavalry, is considered of sufficient importance to be worthy of special study."

Immediately after the reading of his paper a set of resolutions were sent to the President with the result that two medical officers were immediately appointed to observe the armies in the east. One with the Japanese and one with the Russians.

To illustrate the beautiful lessons taught by the Japanese, I take the liberty to quote again from Dr. Seaman various points of his paper worthy of special attention at this time and bearing upon the subject before us.

"The Japanese are the first to recognize the true value of an Army Medical Corps. Care of the sick and wounded consumes but a small part of their time. The solution of the greatest problem, preserving the health and fighting value of the army in the field by preventing disease, by careful supervision of the smallest details of subsisting, clothing and sheltering the units is their first and most important duty.

"Their capacity for detail is something phenomenal; nothing seems too small to escape their vigilance, or too tedious to weary their patience, and everywhere in the fields with the scouts, or in the base hospitals at home, the one great idea is the prevention of disease.

"The medical officer is omnipresent; you will find him in countless places, when in an American or British army he has no place. He is as much in the front as in the rear. He is with the first of the scouts with his microscope and chemicals, testing and labeling wells so the army to follow shall drink no contaminated water.

"When the scouts reach a town, he immediately institutes a thorough examination of its sanitary condition, and if contagion or infection is found he will quaran-

tine and place a guard around the dangerous district. Notices are posted so the approaching column is warned and no soldiers are billeted where danger exists.

"Microscopic blood tests are made in all fever cases and experts, fully equipped, form part of the staff of every division headquarters. The medical officers also accompany foraging parties, and with the commissariat officers, sample the various food stuff, etc.

"The medical officer is also found in camp, lecturing to the men on sanitation, and the hundred and one details of personal hygiene, how to cook, to eat and when to drink, to bathe and even to the direction of the paring of the finger nails to prevent danger from bacteria.

"But it is in that far more terrible and pathetic class of losses, the needless sacrifice of four hundred lives to preventable disease for one hundred who die legitimately, that the most astonishing reduction will be shown. If the testimony of those conversant with the facts can be accepted, supplemented by my own (Dr. Seaman) limited observation, the loss from preventable disease in the first six months of the terrible conflict will be but a fraction of one per cent."

This, too, in a country notoriously insanitary. Compare this with the fearful losses of the British from preventable disease in South Africa, or worse, with our own losses in the Spanish-American War when in campaign, the actual hostilities of which lasted six weeks, the mortality from bullets and wounds was 268, while that from disease reached the appalling number of 3,862, or about 14 to 1, or 70 per cent. One per cent. against 70 per cent. Regardless of the ultimate outcome of this terrible war in Manchuria, history will never again furnish a more convincing demonstration of the benefit of a medical, sanitary and commissary department, thoroughly organized, equipped and empawered to overcome the silent foe. "Every death from preventable disease is an insult to the intelligence of the

age." "When it comes in any army where the units are compelled to submit to discipline, it becomes a government crime." Witness the French campaign in Madagascar in 1894, where of the 15,000 men sent to the front, 29 were killed in action, and over 7,000 died enroute to and from the scene, from preventable causes. "The Japanese do their killing, but they do it differently. They, too, have their tragedies, but they are legitimate tragedies of grim war, not governmental murders through criminal neglect." Dr. Seaman further along in his article says: "Were these results anticipated by the Japs? As an answer, the statement of a distinguished Japanese officer, when discussing with me the subject of Russia's overwhelming numbers, is pertinent. 'Yes,' he said; 'we are prepared for that. Russia may be able to place 2,000,000 men in the field. We can furnish 500,000. You know in every war four men die of disease for every one who falls from bullets. That will be the position of Russia in this war. Every man who dies in our army must fall in the field of battle. In this way we shall neutralize the superiority of Russian numbers and stand on a comparatively equal footing?'" Dr. Seaman, in discussing the condition in our own army, says: "But what can be expected of a government that after its terrible lessons of 1898-9 still insists—especially in the tropics—of subsisting its army on a ration so rich and elastic (lovely term, that elastic), so elastic that when in emergency of war its elasticity is tested, it bursts its bands, and is found to consist of pork and beans, and fermented canned rubbish that in six weeks prostrates 50 per cent. of its 25,000 units with intestinal diseases, and sends 3,000 to their last homes, to say nothing of the enormous number invalided and the 75,000 pension claims? That in its famous reorganization of 1901 fails utterly to recognize one of the most important of all the departments, namely, that of sanitation, as it is recognized by the Japanese to-day? That holds its great life-preserv-

ing department in such light esteem, that but one officer in the entire army can even reach the rank and emoluments of a brigadier-general? That on its general staff fails to have a single representative of this department, and if any only a young, inexperienced officer in or out of the service, one of international reputation like our retired Surgeon-General Sternberg, whose rank should not be less than that of a Major General, and whose opinions would carry weight in councils of war? I tell you gentlemen, rank and its emoluments count. Without position, its pay and its dignities, especially in the army, it is impossible to enforce the respect and discipline necessary for obedience and order. This is the curse, and cause of failure of the British medical service also, where, instead of 'Saw bones,' and which in its organization is as far behind Japan as are the Americans." Herbert Spencer, in his synthetic philosophy, refers to the ill-treatment accorded the medical officers of the English army as a late survival of the days of feudalism and contempt for the purely scientific.

To further impress you with the necessity of action I can do no better than quote again from Dr. Seaman's masterly address: "What can we expect of a congress that permits a lot of well meaning but misguided fanatical women to degenerate its army by depriving it of one of its most beneficial features, a well-regulated canteen, the outgrowth of the best thought and experience of able, trusted officers, thereby driving its fighting units to low groggeries and brothels, from which they are frequently brought back by the patrol, candidates for the guard-house or venereal wards of the hospital, or both?

"Why, I ask again, should we expect reforms from authorities who, in their great preparatory schools, West Point and Annapolis, furnish the cadets no instruction in the important studies of physiology and hygiene, so that when they come to command the fighting units of

the army, they can be prepared to guard them against the silent foe which scores 80 per cent. of the deaths! Like the rest of the world, we go blundering on, spending millions annually for the maintenance of these great military schools and arsenals and war colleges, educating men in the art of human destruction, while the more formidable adversary in the ranks—the grim spectre that kills 80 per cent., is left comparatively unheeded."

I take issue with Dr. Seaman on one point only, namely, the object of blame. I am firmly convinced that our own profession is to blame. See how hard we have fought for years in civil life in the direction of preventive medicine. We all know how difficult was the task to convince even our own state legislature. It is time now, gentlemen, to direct some thought to our army. Our congress is ignorant, and must be educated. With a sincerely patriotic and up-to-date President in the chair, now is the time to voice our sentiments.

Therefore my earnest appeals to you, gentlemen, in behalf of our beloved professional brethren in the army, if not for the safety of the Government itself. If, by quoting from others who are in a position to speak authoritatively, I have enlightened this society and aroused its patriotic elements to action and continued action until our Republic can boast of the most perfect medical corps in all the world, my feeble effort has not been in vain.

DISCUSSION.

Dr. Van Buren Knott, Sioux City, Iowa—It was my fortune to be surgeon of the Iowa regiment during our late unpleasantness in 1898, and I can testify to the absolute inadequacy of the service referred to by Dr. Macrae, and to our inabiltiy to get the necessary amount of supplies when requisitions were made, but which never reached the proper officers. There is nothing more certain than that the volunteer officers and contract surgeons of the army are almost totally or absolutely powerless to help the suffering soldiers. I wish to endorse the paper in every particular, and insist that

the time has come when the United States should take front rank in the matter that he refers to. Japan has taught us many things in regard to the medical department of the army, and America can well afford to emulate that country. This Association should endorse this paper and take any action which may be necessary to further the passage of this bill.

Dr. D. S. Fairchild, Des Moines, Iowa—Within a month or six weeks I served as a member of a committee to confer with Mr. Hull in regard to this bill, which is before Congress. It has been shown that there are now twenty vacancies in the regular service, and they are increasing, on account of the fact that the rank which medical officers may hope to attain before retirement, namely, that of Major or Lieutenant-Colonel, is not sufficient inducement for young men to apply for these positions. It is believed that those who present themselves for examination and can pass, particularly those who have taken post-graduate work for this purpose are men who can receive more honor and credit in civil life than in military life, they are therefore unwilling to become candidates for these places.

Mr. Hull objected to the bill on account of the expense. He was willing to compromise by increasing the number of higher grades, so that a man could expect or hope to reach a higher rank at the time of the expiration of his service at the age of sixty-four; but he was unwilling to increase the number of those in the lower grades. I understand that Mr. Hull's views have changed somewhat since then. The Chairman of the Legislative Committee of the American Medical Association—Dr. Reed, of Cincinnati—has started the political side of the Association to work, and Mr. Hull is now receiving a large number of letters from doctors all over the country, urging his support of this bill, and in view of the fact that he is hearing from doctors and is coming to an understanding of the fact that they have votes and may become politicians, under such circumstances, he has changed his views. A resolution from this or any other society amounts to very little. Most of these resolutions are pigeon-holed; but if the men who can control votes wrote personal letters to Mr. Hull, that the doctors mean business in this matter, it will go further than any resolution which we may pass. If you want to influence Mr. Hull, write him, and

induce your friends to write to him. Give him to understand that we in the Seventh District wish to impress him with the idea that we have some votes to cast, and that we are interested in that bill. After all, it is simply a question of influencing votes. If we can impress on him the importance of the passage of the bill which has been presented by the Surgeon-General, and approved by the Secretary of War, we shall be able to accomplish something in this direction.

Dr. C. E. Ruth, Keokuk, Iowa—This subject is dear to me, because almost immediately after leaving the service I wrote up the conditions, in which I stated my views at the time, which, I believe, are familiar to many of you. Some of the conditions were preventable. They were a disgrace to the country. The strange part of it is that the lessons learned during the Civil War regarding soldiers on the march and sick in camps by men who located the camps in the Spanish-American War, who had seen active service in the Civil War, were forgotten. Our President was a soldier, and our Secretary of War was another soldier, who had learned these lessons, yet in that short length of time they were forgotten, and they had to be learned over again at a fearful cost. The pension roll, as has been said, is an enormous addition to the expenses of the government; but the expense of maintaining during the next fifty years such an addition to the United States army as is asked for in this bill would be the merest bagatelle as compared with the results of our six months' unpleasantness with Spain, during which there were not more than six weeks of active campaigning. The men were undermined in health when they were supposed to be prepared for active service. I believe that the Hon. J. A. T. Hull is not so dishonorable as to ignore the opinions of the men from the various districts of his State or any other State in the expression of what we believe is an honest opinion of the needs of the government, as indicatd by our own observations and experience in the Spanish-American War. I wish to thank Dr. Fairchild for his suggestion, and I shall write Mr. Hull on the subject, and express the hope that he is concerned more than with the Seventh District of Lowa; that he is concerned with the whole State, as well as with the welfare of the soldiers of this country. He wants the soldiers to be as efficient as possible, and though anxious to pre-

serve his own popularity, I feel that he will not be influenced to sacrifice the lives and health of men for the purpose of gaining political preference.

DR. MACRAE (closing the discussion)—In my paper I made a plea for a more efficient army medical corps. It is necessary for us to educate the people of the United States in this particular. The regular army officer can not do very much. He can not go about and say what he pleases, as you all know; and I believe a resolution is in order. (Dr. Macrae then introduced a resolution bearing on the matter under discussion, which was unanimously adopted. See minutes.)

REMOVAL OF THE COVERING OF THE OVARIES IN OVARIAN DYSMENORRHEA.

A PRELIMINARY STUDY.

GEORGE G. EITEL, M.D.

MINNEAPOLIS, MINN.

There are quite a number of so-called varieties of dysmenorrhea, due to certain pathologic conditions of the uterus, tubes, and ovaries. Various classifications are given by different authors, such as congestive, inflammatory, obstructive, membranous, ovarian, etc. In order to make this paper as brief as possible, only the ovarian variety will be discussed.

Many women between the ages of 16 and 40 suffer intensely from ovarian dysmenorrhea. Most of these patients give a history of their periodical suffering as beginning a year or two after menstruation became established, and increasing in severity from year to year in spite of all medical treatment. There are also some cases where the dysmenorrhea does not come on until somewhat later in life, say, at the age of twenty.

Sufferers from ovarian dysmenorrhea are not confined to any distinct class of society. They are found among all classes, in the country on farms, as well as in the villages and cities. They are usually, however, according to the writer's observation, persons who have done a great deal of worrying during the years of their physical development.

Some of these patients enjoy quite good general health, aside from their periodical suffering, while others are almost complete physical and mental wrecks.

All of the severe cases of ovarian dysmenorrhea among the married that it has been the opportunity of the writer to study, gave a history of never having been pregnant. In all of the cases examined with a sound, it was found that the cervical canal was patulous.

Patients suffering from this form of dysmenorrhea, have ovaries that are covered with a tough and greatly thickened serous covering. Under this covering are found many small cysts, varying in size from that of a small pea to a small marble. The periodical pain seems to be in proportion to the thickness and the extent that this covering of the ovaries exists, and thus prevents the dehisence of the Graafian follicles. The covering of the ovaries is generally very tense; this is especially found to be so in cases operated upon at a time when the suffering is still great, as the writer has had occasion to observe in a number of instances.

What to do with these cystic ovaries has been a subject for discussion on many occasions. Some surgeons favor oöphorectomy, others resection, and still others advise puncturing the cysts.

None of these methods has been satisfactory in all instances. The removal of the ovaries, thereby bringing about the menopause, produces in many cases very bad nervous and mental effects; and this is especially true of women who are naturally of a melancholy disposition. Resection and puncturing the cysts always gives more or less relief for a short time, but the patient will then be obliged either to have a more radical operation performed or to continue to suffer until the menopause, as the following cases will illustrate:

Case 1.—Miss A., who began to menstruate at the age of 13, but did not suffer much pain at the menstrual period until her 19th year, from which time she grew worse from month to month. She was treated by several well qualified physicians, but no one succeeded in giving her permanent relief. As her suffering got

beyond endurance, she was directed to the writer for an operation. It was found on examination that she had a very sensitive right ovary. A median abdominal incision was made. The right ovary was found to be somewhat larger than normal, and was covered with a very thick and tough covering, under which were closely studded many small cysts. The portion of the ovary that contained the greater number of cysts was resected, while in the other portion the more scattering cysts were punctured or incised with a scalpel. The left ovary was perfectly normal in size, and its covering thin and soft, and there were no cysts. This patient made a very prompt recovery, and was entirely free from dysmenorrhea for five periods, when the pain gradually came on again and got worse with each succeeding period until she became fully as great a sufferer as before. She underwent another abdominal section, and the right ovary was again found to contain cysts and the capsule very tense. At this time the ovary was removed, after which the patient again enjoyed first-class health for over three years; but she is now suffering considerable at her menstrual periods, and in all probability the remaining ovary is becoming cystic.

It is now over four years since the writer began to remove the thickened covers of ovaries, and, in most instances, with complete relief of the dysmenorrhea. His success has especially been most gratifying in cases where no tubal inflammation co-existed, and also since his technique was improved by shortening of the utero-ovarian ligament, thus preventing the ovaries from prolapsing and possibly becoming adherent in a very undesirable position.

The writer has operated upon twenty-six cases, all of whom have improved as nearly as is possible for him to learn. Some declare that they are entirely well as far as their dysmenorrhea is concerned.

As above mentioned, the married women suffering

from ovarian dysmenorrhea gave a history of never having been pregnant; and thus far the writer has no knowledge of any having become pregnant since operated upon, although the menstrual periods have been regular in every respect so far as it is possible for the writer to ascertain. Of the twenty-six patients operated upon, nine were maidens and seventeen were married women.

TECHNIQUE OF OPERATION.

The ovary is brought into clear view through a median abdominal incision; one hemostatic forceps is placed at the juncture of the utero-ovarian ligament and ovary, and another on the upper border of the broad ligament close to the ovary (lateral). By means of these two forceps the ovary is held by an assistant in the proper position, while the operator makes an incision with a sharp scalpel from the utero-ovarian ligament to the lateral attachment to the broad ligament, through the covering, and then carefully dissects one side, and then the other, down as far as cysts are encountered. The flaps of the covering of the ovary are now trimmed off, preferably by means of a pair of scissors. This having been done the utero-ovarian ligament is shortened by doubling it upon itself in a similar manner as is in vogue in shortening the round ligaments, in order to hold the uterus in a normal position. There is generally some hemorrhage as the base of the ovary is encroached, which can easily be controlled by pressure-forcep and fine ligatures.

ADHESIONS.

The writer will not be surprised to have objections made to this operation on the ground that adhesions will form after stripping the ovaries of their peritoneal covering. While this may be so in some cases, it is safe to say that they can be limited to the case where there exists, or has at some time existed, an inflammatory condition which produced adhesions that had to

be broken down at the time of the operation; but if no other raw or injured peritoneal surfaces exist there will be absolutely no danger of adhesions forming. It has been the writer's opportunity to reopen the abdomen in two of his cases some months after the first operation. One was for an appendectomy in which both ovaries were found to be rather small, but no adhesions whatsoever could be found. The other case was for retroversion of the uterus, where a ventro-suspension and removal of a diseased left Fallopian tube had been made at the time of the operation. In fact, the latter operation was considered of secondary importance. In this case the left ovary was found adherent to the stump of the Fallopian tube, but the right ovary was perfectly free, soft and smooth, rather small, and entirely free from cysts.

Case 2.—Mrs. G., aged 23, American, married, was admitted to the hospital Nov. 5, 1903. She has always been well, with the exception of occasional attacks of indigestion. Mentruation appeared at the age of 14. The first day of the menstrual period the patient suffered with considerable pain of a cramping character. The second day the pain increased in intensity, and was felt over the entire abdomen. During this last year since her marriage the pain has been worse. The patient has never been pregnant. Upon operation, November, 1903, both ovaries were found cystic, and covered with a dense fibrous capsule. The cysts were punctured, the capsules dissected off carefully, and the ovaries attached to the cornua of the uterus, which in turn was anchored to the abdominal wall.

Since the operation the patient has complained of pain during the menstrual period, but its severity is lessening each month, and she is improving in general health.

Case 3.—Miss A. J. M., Swede, aged 23 years, was perfectly well until she had typhoid four years ago.

Since then she has menstruated every two or three weeks. At each period the patient lost an excessive amount of blood. On examination the pelvic organs seemed normal, with the exception of sensitiveness over the ovaries, which was greater on the right side. She was operated on Dec. 8, 1903, at St. Barnabas Hospital. The ovarian capsules were found to be dense and fibrous, and the ovaries were cystic. After the cysts were punctured and the capsules dissected off, the denuded ovaries were rubbed with the omentum and replaced in the pelvis. Her convalescence was uninterrupted. Since leaving the hospital she has gained constantly and rapidly. Her entire appearance has changed, and there has been no menstrual pain since the operation. The interval between the periods is gradually lengthening, while the amount of blood lost each time is markedly diminished. She is gaining in flesh, in color, and in spirits.

Case 4.—Miss B. O., Swede, aged 21 years, has been a teacher in our public schools for three years, Since maturity, which occurred during her fourteenth year, she has suffered with intense pain at her menstrual periods. This pain invariably began two or three days before the flow was established, continued during the period, and lasted from a few days to a week after the cessation of the flow. Instead of being central or in the uterus, the cramps were in the ovaries, and worse on the left side. On palpation the left ovary and tube were found to be extremely sensitive. The patient had become so reduced in strength from this suffering that she has been unable to teach since the autumn of 1903.

On operation both ovaries were found to be cystic and covered with dense, fibrous capsules. After the cysts had been punctured the capsules were dissected away, the wound was closed, and the patient put in the lithotomy position. An examination of the cervical canal was made, which was found to be perfectly normal.

This patient is entirely free from all pain at her periods, and her general health has very greatly improved, it being almost a year since the time of operation.

CASE 5.—Miss M. N., an unmarried woman, aged 23 years. This patient says she has never enjoyed rugged health. Since the establishment of the menstrual flow, at 13 years, she has been troubled greatly with dysmenorrhea as well as with sensitive and sore ovaries. She is the only one of her family who is similarly troubled. Her work, she thinks, has largely aggravated the trouble. Being a dressmaker, she frequently runs the sewing-machine all day. As in the above quoted cases, the dense capsules were dissected from the ovaries. After the operation, in February, 1903, she was greatly relieved for several months. Her general health is somewhat better. The pain, however, has reappeared at the beginning of the last three periods. It lasts for the first few hours or until the establishment of the flow.

CASE 6.—Miss S., age 21 years, began to menstruate at the age of 13, and has since been a great sufferer at her periods. She also suffered two attacks of appendicitis, on account of which she was sent to the writer by her physician. Since she gave a clear history of ovarian dysmenorrhea, a median incision was made in order to examine the ovaries at the time of the appendectomy. After the appendix was removed, the ovaries were found to be cystic, and therefore the serous covers were dissected off and the utero-ovarian ligament shortened. After nearly a year the patient is still free from all pain.

CASE 7.—Mrs. B., age 28, married four years, never pregnant. Suffered intense pain at her monthly periods, the pain lasting about two weeks. There was great tenderness in the ovarian region, especially on the left side. This patient has been a sufferer more or less since her sixteenth year, but seemed to grow worse from

year to year. All methods of treatment had been resorted to. The last was a thorough dilation of the cervical canal, and the insertion of a glass stem. As she was not benefited by any treatment, she was sent to the writer for an abdominal section April 4, 1904. The ovaries were found very tense and cystic. The coverings of the ovaries were removed, the utero-ovarian ligaments shortened, and the abdominal incision closed. The patient has had her monthly periods regularly since the operation, and with but very little discomfort. Her general health has greatly improved.

THE DIAGNOSIS OF EARLY TUBAL PREGNANCY.

WILLIAM E. GROUND, M.D.

SUPERIOR, WIS.

I can not hope to enlighten this society upon the subject I have chosen, but the condition has interested me so much that I ventured to introduce it here with the hope that it may elicit a free discussion.

During the last year I have operated upon ten cases of tubal pregnancy, and two months of the year I was away from home, so that I averaged one case a month while in practice. I have operated upon 28 cases altogether, all recovering.

The frequency with which extrauterine pregnancy occurs, is variously estimated at from 1 in 500, to 1 in 10,000 pregnancies. There are reasons for this discrepancy. In the first place our means of investigation and our diagnosistic acumen are much improved, and our knowledge of pelvic pathology is such that a clearer insight into the origin of pelvic hematocele leads us to believe that they almost always arise either from a tubal abortion or from the rupture of a pregnant tube. Localities where gonorrheal infection is more prevalent, causing an alteration in the tubal mucosa, might account for a large number of cases. Suffice it to say that ectopic gestation is of sufficiently frequent occurrence to demand an attitude of alertness that will save many lives that are now lost and the attending physician the humiliation of a distressing experience.

Quite a careful perusal of the literature of this subject gives me the impression that tardy diagnoses and delayed remedial measures, are the rule, and that a just appreciation of the exact condition is rarely made prior to rupture of the tube. The text-book traditions are too frequently adhered to and the impression given that there are no symptoms sufficiently distinctive to enable us to make a diagnosis, until pronounced indications of internal hemorrhage occurs. True, now and then a man in discussing this subject has laid special stress upon early recognition, but the vast mass of literature deals not with the pregnant tube, but with the complications. The time was when we were discussing pus formation, limiting adhesions, peritonitis and septicemia in connection with the appendix, but now the man who allows his appendicitis cases to become complicated before recognizing the condition and instituting operative measures, would by this society be considered an unsafe medical adviser, to say the least. I believe the time is coming when it will be just as culpable to stand by and allow a pregnant tube to rupture before offering assistance. Now we study the initial lesion in the appendix, gall bladder, stomach, etc.; the same should be done with the fecundated tube. While pregnant tubes may not be quite so common as infected appendices, clinically their termination is scarcely less disastrous. By early diagnosis is not necessarily meant so many weeks or months; but before the yielding of the tube, and the escape of the fertilized ovum, before, as Sir Frederick Treves says, peritonism occurs; after that all cases are late cases. I do not mean to say that early operation in every case of ectopic gestation is necessary to save life. In many cases it will be a life-saving measure, in all a saving of morbidity. Presumably the human ovum is usually fertilized in the Fallopian tube. During its early stage of development, the ovum produces on its exterior a thick layer of cells, the tropho-

blasts. The trophoblastic cells corrode away so to speak, a portion of the uterine mucosa, to make a cavity in which to lodge itself. The trophoblast then undergoes hypertrophic degeneration, so as to produce a series of irregular spaces, which become the inter-villous spaces of the placenta. Thus is inaugurated the formation of the true chorionic placenta. By the time the fertilized ovum reaches the uterus its trophoblast becomes functionally active and at once burrows by phagocytic action into the mucous membrane of the fundal portion of the uterus. But should the functional activity of the trophoblast be delayed until the ovum reaches the lower uterine segment, owing to late fertilization, it is not unlikely that the ovum would attach itself in that zone, with the formation of a serotinal placenta prævia. An ovum devoid of trophoblast can not attach itself, and will be carried away by the ciliary current in the absence of any intrinsic motile power of its own. Other things being equal, the arrest and implantation of the ovum depends on the functional activity of the trophoblast, and may occur in any part of the genital tract, from the ovary down to the cervix. Should the attachment take place in the Fallopian tubes, tubal gestation results; in the upper or middle uterine zone we have normal pregnancy, while should it be arrested in the cervical zone, placenta prævia will be the consequence. (Sinnetamby.)

Relative to the etiology of ectopic gestation, opinions are conflicting. Henry Russel Andrews, in a masterly article, published in *The Journal of Obstetrics and Gynecology* of the British Empire, September, 1903, attempts to classify the evidence concerning the conditions which have been considered to be the cause of tubal pregnancy. He divides them under eight headings:—

1. Salpingitis and perimetritis.
2. Persistence of infantile conditions in the tube.

3. Polypi, diverticula, etc., in the tube.
4. Puerperal atrophy of the tube.
5. Atavism, reversion to a lower developmental type.
6. External wandering of the ovum.
7. Internal wandering of the ovum.
8. Abnormalities of the ovum itself.

Besides these, mental shock or excitement during coitus, causing peristalsis in the tube, has been considered to be a cause of tubal pregnancy. It is highly probable, as seems apparent from a careful perusal of his paper, that any one of these factors may favor the detention of the fertilized ovum in the tube and possibly in the ovary, until the outer layer of the ovum, the trophoblast, makes a place for itself in the tubal wall. Opitz examined the pregnant tube in 23 cases of early tubal fetation, and found marked changes in the peritoneal and muscular coats, in the form of old membranous adhesions, kinks, narrowed ostium, and sub-serous cysts. The most conspicuous changes in the tubal mucous membrane consist in firm union between the neighboring folds or between the branches of the same fold. These unions were not simple loose adhesions, such as are frequently found in a recent salpingitis, but broad fusions of the stroma. There were no signs of inflammation in the neighborhood, and no dividing line between these folds could be seen. The epithelium was normal in appearance. The condition therefore appeared to be the result of an inflammation long gone by. These observations were made from sections of the tube between the ovum and the uterus. The serial sections showed that as a result of these adhesions between the folds, branches of the tubal lumen were formed, which often ended blindly in a cul-de-sac, into which an impregnated ovum might easily wander, become arrested and continue to grow.

Although the deductions I have drawn from my cases have been based on the histories and the gross appear-

ance of the uterus and appendages at the time of operation, I am firmly convinced that ample pathology was present to cause the arrest of the fecundated ovum in the tube. Five of my cases were primipara, who gave a history of painful menstruation and leucorrhea. Thirteen cases gave a history of a prolonged period of sterility; by this I mean 3 years or longer. The remaining 12 cases occurred in parous women who had borne children or had been pregnant in less than three years. Many of these women gave unmistakable evidence of pre-existing pelvic disease. One primipara had been married three years, one five, and another eleven years, before tubal conception occurred. Two cases occurred in unmarried women, one of whom had had a criminal abortion produced. Complications arose and she was sent to me for abdominal section, when an unruptured tube containing a six week fetus was found. Another case, a grass widow, was known to have had chronic appendicitis, took with sudden severe pain in the right lower abdomen, followed by shock of a considerable degree, but she soon rallied and ran a slight fever. At this juncture I saw her. Menstrual irregularities denied. Tenderness present rather low in iliac fossa for appendicitis, uterus enlarged and slight bloody discharge coming from the vagina, ill-defined tumor to the right of the uterus. Abdomen opened and found to contain blood clots and bloody serum. Right tube was ruptured on its dorsum at about the middle, but fetus was still in the tube. Chronic appendicitis was also present and the appendix removed. Two cases had small fibroids and one had an ovarian cyst as large as an orange on the opposite side.

In determining the existence of extrauterine pregnancy, we will rarely find indications of emphatic pelvic disease. Severe and pronounced pelvic lesions preclude, as a rule, tubal gestation. So marked has this been the case that many good authorities have been

unable to demonstrate what they considered anything abnormal about a pregnant tube distinct from its fetation. The fact of the matter probably is, only lesser lesions or a normal state of the generative organs allow impregnation to occur at all. Much disease or deformity in or about the uterus, tubes or ovaries, prevents conception. Witness the sterility in subjects of fibroids, salpingitis and organic ovarian disease. Of course there are many exceptions, having been called upon myself to operate neoplasms complicating pregnancy, but these are so rare as to demand a separate report. The wide-spread prevalence of gonococcal infection is to my mind a most prolific cause of tubal pregnancy. Wertheim first showed that gonococci could penetrate all the layers of the tube wall and that inflammatory changes in the tube wall and peritoneum were evidences of gonococcal invasion. We are familiar with the tendency of the gonococcus to produce chronic and deep-seated lesions, and with tissue alterations so slight as to, in many instances, preclude observation unless by the closest scrutiny. The confirmed prostitute is sterile because of her repeated gonorrheal infections. She has too much pathology to allow impregnation to occur. And then parturition predisposes to tubal pregnancy by traumatism and mild infections, leaving the woman with cervicitis, endometritis and salpingitis, subinvolution and relaxation of the pelvic floor, endowed ofttimes with partial invalidism and sterility. Perhaps after a few years the tendency to sterility is partially overcome and she becomes pregnant in the tube. That many women even after a, to all intents and appearances, normal delivery and puerperium, are left sterile for a greater or less length of time—one-child sterility—is a matter of common observation. Pregnancy rarely takes place at all in active infective inflammations, so that it is in inflammatory reactions of minor degrees, chronic and end results, that we would expect to

find influencing the generative tract, not enough to prevent conception, but enough to prevent its passage into the uterine cavity.

Consequently we must be prepared to develop a case of tubal pregnancy out of an inconspicuous and brief history. As usually considered these women do not as a rule suffer enough inconvenience to send them to a physician prior to rupture, but according to my experience, most subjects have consulted a physician one or more times before the disastrous results had forced recognition.

The basis of the diagnosis is the carefully developed history and the physical findings. The examination of every case should be approached with attention to detail. The least deviation from the normal should be noted, as in the early diagnosis we are of necessity dealing with slight changes. Preconceived ideas should be eliminated, for prejudice and bias often keep us from seeing what would otherwise be perfectly plain. After the evidence has been secured we must go over it again and again, for conclusions arrived at by a single observation are of little value. Patients do not come to us labeled such and such a disease, but with symptoms for interpretation.

Tubal pregnancy partakes of the nature of uterine pregnancy, with special pathologic conditions, pathologic only in the sense of being misplaced. The great difficulty in making a positive diagnosis of early uterine pregnancy is well known, while the signs of early tubal being less marked, the difficulty is immeasurably increased. But as a frame-work upon which to spread our diagnostic map, perhaps none is so well fitted as is normal gestation. Tubal pregnancy has more of the ear-marks of intrauterine pregnancy than any other one condition. While all of the signs of intrauterine gestation may not exist in any given case of tubal, or if they do it is in a modified degree, still they are suf-

ficiently prominent and well defined in the vast majority of cases to be strongly presumptive. In the first place, upon the site of implantation and development of the gestation sac depends largely the manifestations. Primary implantation occurs in the tube as it passes through the uterine wall, tubouterine or interstitial, representing about 20 per cent. of the cases; in the tube proper about 50 per cent.; ampullar, or in the fimbriæ-infundibulum, about 25 per cent., while pregnancy occurring in the uterine cornua, in a bi-lobed uterus, and a possible few cases of ovarian pregnancy, make up the other 5 per cent. Strictly speaking, approximately in 98 per cent. of the cases the primary lodgment of the fecundated ovum in ectopic gestation is somewhere between the uterine ostium and the fimbriæ. Primary ovarian pregnancy is the rarest of specimens, and primary abdominal pregnancy is practically admitted to never occur. According to Bland-Sutton and Kamann, fetal sacs in the peritoneal cavity are due to rupture of the uterus and extrusion of the sacs into the abdominal cavity.

Webster says "that the fertilized ovum coming in contact with any portion of the Mullerian tract, is capable of establishing with it that relationship that is necessary to its growth," and the rest of the tract shares in the changes and either establishes sympathetic relations with near and remote organs, or affects them by internal secretions of the ovaries, or through the influences of toxic substances. Upon the proposition rests the interpretation of many of the phenomena of ectopic gestation.

In normal pregnancy, the cessation of or the interference with the normal menstrual function is the most common, as well as one of the earliest, of the units of the symptom complex, that warrants the diagnosis of a fecundated ovum in the uterine cavity. Every woman does not conform to the same menstrual stan-

dard, although her menstrual function may be normal so far as she is concerned; but every woman does have her menstrual habit, a deviation from which should lead us to look very carefully for a cause. In doing so we must remember that the causes of menstrual disturbances are many and varied. In tubal gestation I have observed a large variety of variations, the most common being the skipping of a period completely, either for a few days, a week or perhaps a month and then its occurrence as a rule with profuse and irregular bleeding. I have had two cases in which there was no noticeable bleeding from the vagina, until just before rupture and a violent internal hemorrhage occurred at or about the regular menstrual period following impregnation. I have observed several cases in which menstruation was deferred for a day or two, or perhaps a week, and then a slight flow, or a spotting at intervals of a few days, or there would be a continuous discharge producing a dirty colored maroon stain on the napkin.

Another symptom, perhaps not of less importance than menstrual irregularities, is pain. Pain is what sends most patients to a physician in this as in other diseases, and if properly interpreted is a most important factor in diagnosis.

The peritoneum contains an abundance of Pacinian bodies and when irritated or inflamed, elicit pain. Pain excited by a pregnant tube may be caused by uterine or tubal contraction, or by peritonitic irritation. This may be made manifest by widespread reflected pain, or local pain and tenderness on pressure at the site of lesion. Especially characteristic is the reflected pain over the lower abdomen in the area supplied by nerves coming from the tenth dorsal and from the first to the fourth sacral segments. Although there exists no active inflammatory action in the tube, still marked local tenderness and pronounced rigidity of the abdominal

muscles is frequently seen even before rupture. Abdominal pain and tenderness over the lower abdomen, with history and physical findings, is especially indicative of rupture. But if the hemorrhage is profuse and the shock is profound, the tenderness and rigidity may rapidly subside. These pains seem to have a tendency to recur at what would be the normal menstrual period and are often described as labor-like.

To show how unexpectedly a case of this kind may thrust itself upon our attention, I will relate the following case:

Last August I was hurriedly sent for to see a young woman who had been taken suddenly ill, with, as the messenger said, a severe pain on top of her right shoulder, while standing at the table ironing clothes. I arrived about two hours after the onset. Pain in the right shoulder was the first as well as the most distressing symptom complained of as I approached the bed. She was in considerable shock and a little inquiry elicited abdominal pain and an examination revealed exquisite local pain, tenderness and muscular rigidity in the lower right quadrant. Temperature subnormal, pulse 100. She had not missed a menstrual period, but was just due and began to flow the night before. Physical findings negative. Diagnosis, internal hemorrhage, of probable ectopic origin. She was sent to St. Mary's Hospital, Superior, and operated on August 28. On opening the abdomen, it was found filled with liquid and clotted blood, and right tube torn clear across at about one inch from the uterine cornua. A very young embryo was found adherent to the proximal stump. The uterus was slightly enlarged and retroverted, but no adhesions, otherwise everything about the pelvis was normal to the naked eye.

A further history of this case may be of interest. I had attended this woman a year and a half before in normal labor. First child. She nursed her baby for a year and began menstruating soon after wean-

ing, and was regular up to the time just mentioned. This woman suffered the trauma usually inflicted at every average labor, and the usual postpartum repairs were made. Her puerperium was without incident, save perhaps she was a little slow in regaining her strength. Referring to my notes taken two months after delivery at my usual post-puerperal examination I find noted: On examination table with thighs flexed at right angles to the abdomen, I find recorded moderately gaping vulva, with anterior and posterior vaginal wall in view without touching the patient; skin perineum intact, straining decidedly increasing the vaginal prolapse. Digital and bimanual examination disclosed a noticeable relaxation of the pelvic floor, an unhealed laceration of the cervix on the right side, uterus with tendency to retroversion and rather heavy for this period after delivery, showing that involution had not progressed normally; left ovary prolapsed. With recommendations this woman left the office and nothing further was heard of her until called to see her as above stated.

I relate this case rather in detail because here was a woman who to all appearances was well and considered herself so, but who upon investigation had ample cause to be tubally pregnant. The relaxed pelvic floor, the retro-posed uterus, the mild infection that must have been present from the cervical laceration and probably carried by the lymphatics through the broad ligament to the tube of that side, might easily affect its mechanism sufficiently to detain the fecundated ovum in the tube.

Phenomena, Reflex or Sympathetic.—A woman who has been pregnant before, often declares she feels as though she were pregnant. Nausea and vomiting usually appear early and are sometimes very pronounced. The changes in the mammary glands occur later and are not as marked as in intrauterine pregnancy. The nervous phenomena are fully as noticeable.

Physical Findings.—Inspection will often reveal a purplish discoloration of the vaginal mucous membrane. The cervix softens, but this is not as early nor as pronounced as in normal pregnancy. Hegar's sign is vague and illy defined.

Accompanying the pregnant tube we expect and do find enlargement of the uterus, although not to the same degree as in uterine gestation. As Bandl points out, the enlargement is greater the nearer the implantation is to the uterus. Although the fecundated ovum is not in the uterus, that organ proceeds to prepare for its reception by the formation of a decidua. Cazeaux says that the changes occurring in the uterine mucosa, coincident with an ectopic gestation, are of a mixed nature, but adds, that possibly the site of implantation and the duration of its development explain these differences. The intense congestion of the hypertrophied mucosa and the interstitial hemorrhages noted, easily account for the bleeding of uterine origin. He agrees with Pozzi that these changes are due to trophic phenomena of a reflex or sympathetic nature, analogous to those occurring in the breasts.

Macroscopic and microscopic examination of expelled trophied mucosa and the interstitial hemorrhages noted, easily account for the bleeding of uterine origin. He agrees with Pozzi that these changes are due to trophic phenomena of a reflex or sympathetic nature, analogous to those occurring in the breasts.

Macroscopic and microscopic examination of expelled membranes do not assist us greatly, although finding hypertrophied connective tissue or decidual cells would, with other physical signs, be excellent contributary evidence. Chorionic villi being strictly a fetal membrane, we would of course not find them in the uterine cavity in cases of pure tubal pregnancy. Besides an enlarged uterus, we will find upon bimanual examination, tumor formations that are reasonably characteristic, and will in many instances enable us to make a

diagnosis before rupture. At one side of or behind the uterus will be found an elastic, sensitive and often pulsating tumor, usually rather fixed. Further investigation generally distinguishes the ovary external to but not a part of the tumor, and the finger can usually be inserted in an angle between the uterus and tumor. This latter condition may not prevail if the implantation is cornual or in the isthmus. Fortunately from a diagnostic standpoint, the fecundated ovum is arrested in the tube proper—ampulla or at the infundibulum tubæ uterinæ in the vast majority of cases. Unless hemorrhage has taken place within the fetal membranes, in which case the ovum dies, the entire tumor consists of the enlarged tube produced by the fetus and such placental tissue as can be developed from tubal mucosa. It is clear that many other conditions may closely resemble an unruptured pregnant tube, so that it will be necessary to associate intimately a well-taken history of the case. The conditions that come up for differentiation most frequently are ovarian cysts, salpingitis, pyo- and hydrosalpinx, uterine fibromata, vesicular mole and early abortion. An ovarian tumor complicating uterine pregnancy may be very confusing for a time. An ovarian cyst gives a sensation of tense elasticity, is usually more movable and is not tender, as a rule. As Doran says: An inflamed ovary is tender to the touch, whilst an ovarian tumor, complications apart, does not as a rule give rise to pain, nor is a dermoid usually tender. Ovarian tumors if infected, or if the pedicle becomes twisted, are very painful and tender to the touch. Fibroids may produce disturbances of menstruation and a tumor the locality of which closely resembles a tubal pregnancy, but its consistency and feel makes differential diagnosis comparatively easy.

In four of my cases the question of the part played by the appendix was conspicuous. In one case the woman was taken with severe abdominal pain, and later de-

veloped fever, tenderness, and a tumor over the region of the appendix. Had missed three periods. Slight uterine hemorrhage had existed for a month. Uterus slightly enlarged. Abdomen opened and the tumor was found to be a tubal gestation in which the ovum continued to grow after rupture of the tube and liberation of the ovum a month before, the gestation sac becoming implanted on the omentum. The placenta was attached to the tube and right broad ligament and the fetus was still in the unruptured amniotic sac and nearly surrounded by omentum. The rupture that occurred was not fatal to the fetus. The eroding villi had crept out and at once gained omental attachments without losing their hold on the tube, and thus at no time was the fetus cut off from its nutritive supply. This case had been diagnosticated as appendicitis by the attending physician. When she came in for operation the history and physical findings were indicative of ruptured tubal gestation.

We are all familiar with the clinical picture produced by a profuse hemorrhage into the abdominal cavity as a result of a ruptured tube or a tubal abortion. This accident as a rule takes place between the seventh and twelfth week. It may be delayed, but it has been known to occur as early as the second week. It is at this stage that we usually see these cases. The patient is generally perfectly conscious. The pallor of her face, gums and conjunctiva are extreme; the ears and cheeks have lost their blush, the nails are white and present no color when pressed and released, and the hands are cold and clammy. An examination of the pulse shows the tension to be low, the artery expanding with a little quick jump and as quickly subsiding, rapidly becoming smaller, then running in character before it finally ceases to be felt at the wrist. Counting the pulse every ten minutes and observing whether it becomes weaker and more rapid, will enable us to judge as to the progress of the hemorrhage. It is sur-

prising what an amount of internal bleeding these cases will stand, probably owing to the rapid absorption of the serum by the comparatively empty vessels of the peritoneum. The history that this condition of collapse is preceded by sharp abdominal pain can generally be elicited. Extreme degrees of intra-abdominal hemorrhage can not readily be confounded with any other condition, but lesser degrees might be readily mistaken for a number of other lesions, provided the history is not clear or the observations inaccurately made. For instance, perforating gastric and duodenal ulcer with hemorrhage could readily be mistaken for a ruptured pregnant tube, intestinal strangulation, tumors with twisted pedicles and appendicitis.

From the primary points of attachment, there are five directions by which the ovum may escape; by tubal abortion (which Boldt records as most frequently the case), or by rupture of the outer third of the tube it may pass into the pelvis; by rupture of the main portion of the tube it may pass into the pelvis or abdomen; by the giving way of the lower margin of the tube it escapes into the folds of the broad ligament, or it may possibly escape through the uterine ostium and be cast off or form a uterine implantation.

The earliest ruptures occur at the isthmus and it is at this point that the most active hemorrhage will be met and the most prompt surgical interference demanded to save life. In ampullary gestation the muscular coat is not penetrated so early, neither is the hemorrhage so great, and a better chance is given so-called expectant treatment if the medical attendant is so inclined. But early surgical interference is so satisfactory that in competent hands the mortality is scarcely to be considered.

DISCUSSION.

Dr. John P. Lord, Omaha, Neb.—I wish to recite some recent experience which bears particularly on the subject under discussion, namely, the diagnosis of

extrauterine pregnancy. In two of my cases the diagnosis was delayed somewhat on account of other physicians. Pregnancy had taken place near the fimbria, and there was slow leakage going on until a considerable accumulation was present. After the usual symptom of faintness, the patients were able to regain their blood, so that they did not suffer from that. I thought I was pretty smart in making an early diagnosis of extrauterine pregnancy; I have a few mistakes of this kind to my credit, but I thought I pretty nearly always knew when I had extrauterine pregnancy to deal with. I had this conceit taken out of me a short time ago by seeing a woman, the wife of a traveling man who had been home in July. In the latter part of August, when her periods were due, she had missed them. On October 19 she had had some flowing, following an attack of pain at night, and on attempting to go to the bathroom she fainted on the way, so that it was necessary for her to crawl on her hands and knees to get back to bed. The family was alarmed. She had pain and shock thereafter; was treated by her physician, who later recognized that there was a growing mass to the left of the uterus. The uterus was pushed aside. I was called. The history was exactly that of ruptured tubal pregnancy, and with it there was also a history of some flowing, increasing invalidism and anemia. I operated, and found a mass which presented a boggy feel. It was a papillomatous ovary that was cystic, and it had ruptured on these occasions, and had produced pain, shock, and the adhesions which I subsequently found. The mass was about the size of what one would expect a pregnancy to be at that period. I decided that I was not so clever in the diagnosis of extrauterine pregnancy as I thought I had been. This case shows that a papilloma of the ovary may simulate extrauterine pregnancy very closely.

Dr. W. D. Haines, Cincinnati, Ohio—It is not very easy to make a differential diagnosis in some of these cases. I recall one case in which a diagnosis of extrauterine pregnancy was made by a general practitioner. A surgeon was called in who did not concur in the diagnosis. The case went on for about eight months, when labor pains came on, section was made and an eight months' child removed. Both mother and child are alive and well to-day.

Dr. Ground (closing the discussion)—In my paper I spoke of slow hemorrhages. In cases of tubal abortion we may have slight bleeding, which does not always give rise to symptoms of acute anemia. The violent hemorrhages that occur early are in the isthmus of the tube. In the case cited the woman had not missed her menstrual period. She was standing ironing at the table, when she was taken with a severe pain in the abdomen, fell to the floor, became suddenly anemic, was taken to the hospital, operated on at once, and a great amount of blood was found in the abdomen, although the tubal pregnancy was not more than 3 weeks old. Hemorrhages into the folds of the broad ligament usually do not give rise to pronounced shock at time of rupture. In fact, in one of my cases the fetus continued to grow after primary rupture until removal two months later by abdominal section.

A NEW SELF-RETAINING CATHETER AND VESICAL IRRIGATOR.

HORACE G. WETHERILL, M.D.
DENVER, COLO.

No entirely safe and satisfactory self-retaining catheter has ever been devised, and the dangers and discomforts of those heretofore used are such that many surgeons have abandoned them altogether and depend upon frequent catheterization with the ordinary glass or rubber catheter instead. For women the mushroom catheter has been the most satisfactory retention catheter to be had, but its liability to obstruction and imperfect drainage is so great and the discomfort for the patient so hard to bear that the results of its use are often quite disappointing if not disastrous. Then, too, they are not procurable outside of the large cities, and if the surgeon attempts to keep a supply on hand they soon become hard and dry and unfit for use.

For the cure of certain intractable forms of cystitis and of vesico-vaginal fistula, a perfectly working retention catheter is an absolute necessity; and if we are to avoid retrograde infections of the ureters and kidneys and get union of sutured bladder walls, perfect drainage must be maintained. If to perfect drainage we can add a device for frequent irrigations of the bladder with a boric or other antiseptic or soothing solution, the prospect of success will be better. This I have been able to do by adapting my intrauterine flushing and drainage tube to vesical use, making it of smaller sized white rubber tubing, which resists the compression of the urethra and vesical sphincter.

It has the advantage of being always available, as the surgeon may make one for himself in a very few minutes. It drains perfectly and may be used as an irrigator by the nurse at very short intervals, if necessary, without changing the position of the patient in bed, the frequent irrigations preventing obstruction with blood, mucus or urine incrustations. Continuous irrigations may be maintained through it if for any reason they are deemed necessary.

This self-retaining catheter and vesical irrigator is made as is shown in the accompanying cut and as described in my paper entitled: Intrauterine Flushing and Drainage for Infection, etc., published in *American Medicine,* Jan. 30, 1904.

Its introduction into the female bladder is easily accomplished by pushing the center of the loop up with a flat probe or applicator, so that the legs of the tube are parallel. After being well anointed they slip through the urethra easily, and upon the withdrawal of the applicator snap back into the original triangular shape, which prevents their expulsion from the bladder. Then one leg may be connected with a bottle or other receptacle over the side of the bed and the other with a fountain syringe or glass irrigating reservoir, the stream to be continuous (fast or slow) or intermittent as desired.

By leaving the blind stitch out and making the legs of the tubes of exactly equal length, the probe may be put into the angle A and the legs of the tubes held closely along its sides, thus reducing the bulk of the tubes for the purpose of introduction, the shoulder or retention bar being reproduced by making the ends of the tubes even and holding them so with a stitch or safety pin. I have had no difficulty in introducing the tubes as originally made, however, and when so made (with the blind stitch) they are more certainly and easily retained. Their removal is equally easy, as on

withdrawal the tubes fall into parallel lines in their passage through the urethra.

They may be made of a small sized (No. 12) soft rubber catheter, but are better and more apt to remain patulous if made of the white rubber stock.

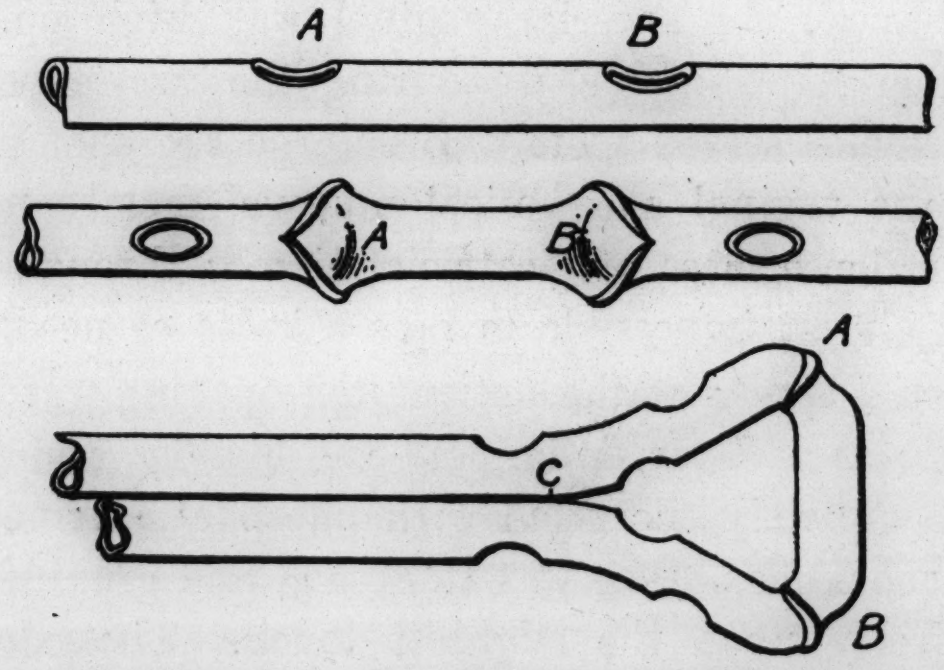
This irrigating retention catheter was evolved to meet the necessities of a particularly difficult and trying case of vesico-vaginal fistula of twelve years' standing, which had resisted eleven attempts at closure at the hands of some of the best surgeons of Denver and Chicago; and to it rather than to any unusual operative technique is due the excellent result attained. During the performance of a hysterectomy by an inexperienced operator, an opening was made into the bladder through the anterior vaginal wall high up. The eleven attempts at closure during the twelve years of its existence served merely to enlarge the opening, cut away the vaginal and vesical mucous membrane and leave a dense mass of cicatricial tissue; through which it was almost impossible to pass a knife or needle.

When I first saw the patient the opening was nearly as large as a silver dollar and the bladder and vagina were completely encrusted with phosphatic urine salts; the mucous membrane was thickened and granular, and bled freely upon the slightest touch. The odor was ammoniacal and putrid, and the surfaces so hyperesthetic as to be intolerant of the gentlest touch. Even under complete surgical anesthesia this sensibility to touch was maintained after all reflexes were abolished.

At first I declined to attempt to close the fistula, as the conditions were so bad and there was so little tissue left to work with. but particularly as the scar tissue and deeply infected mucous membrane of which the flaps must of necessity be made, would be most unfavorable for union. Then, too, I could scarcely hope to succeed where several of our best operators had failed. As a palliative measure I advised the spooning off of the incrustations as the pain and tenesmus they pro-

duced were intolerable. This was done, after which the vagina and bladder were irrigated twice a day with mild antiseptic solutions, and urotropin was freely administered by mouth. The relief from pain and disappearance of the putrid ammoniacal odor were immediate, and marked improvement in the local conditions quickly followed.

Then it occurred to me that perhaps a successful closure of the fistula might be made if perfect drainage of the bladder could be secured along with a continuance of the frequent irrigations, which had already accomplished so much for her in the way of improvement. Concluding that this could be done with my double tubes, the attempt was made.



1. Cut two holes in a long piece of drainage tubing as indicated at A and B. 2. Draw one end of the tube through A and out at B, thus inverting that portion of the tube between the holes as seen in 2. 3. Bend the legs of the tube down so that the holes A and B will be left open for drainage. If bent in one direction they are open, if in the other closed. Tack with a blind stitch at C. Use soap or pulverized soapstone to make the tubes slip.

The usual crater-like denudation of the vaginal mucous membrane was made, the bladder was then dissected off by the flap-splitting method, the posterior wall and fundus being freed and drawn down and sutured to the lower segment with fine chromic catgut, the line of sutures running transversely.

Over this the crater-like vaginal wound was sutured with silver wire in a vertical direction, the two lines of

sutures crossing at a right angle. The double tubes, which were to act as self-retaining catheter and vesical irrigator, were then introduced into the bladder through the urethra. Injection of the bladder now demonstrated that the lines of sutures were water-tight but that the whittled and contracted reservoir had a capacity of less than one fluid ounce.

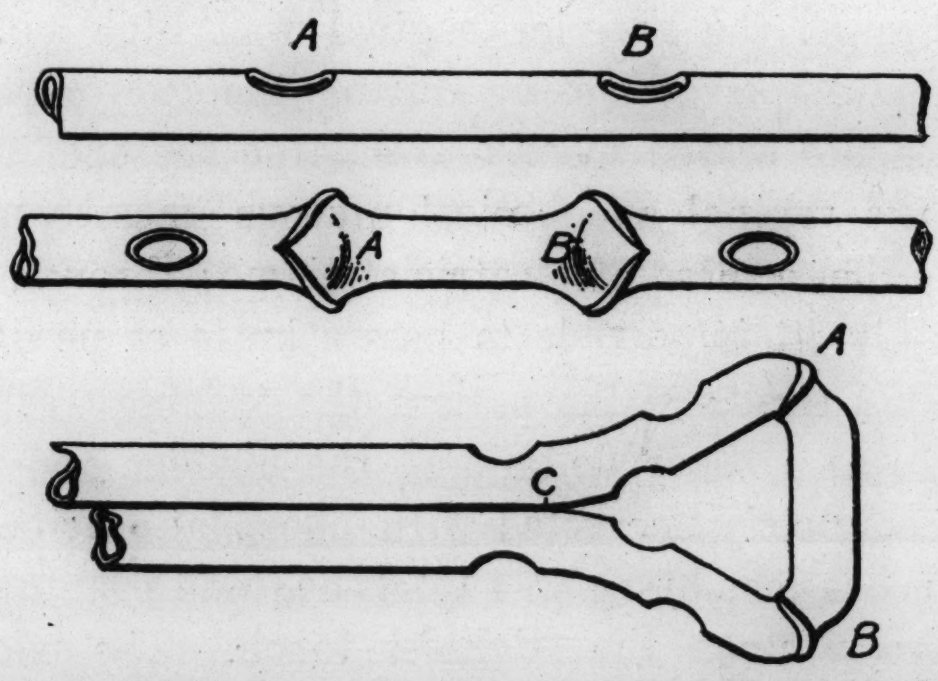
The patient was put to bed and one leg of the tube connected with a bottle hung from the bed rail. Through the other, from four to six ounces of a hot saturated solution of boric acid was allowed to flow from a nasal douche bottle, at first every half hour, and gradually at lengthening intervals. This always relieved and allayed the pain and vesical tenesmus and desire to expel the catheter, and it is to this feature of the management of the case I attribute our success, as the patient afterward said to me: "I suffered continuously from bearing down after my other operations and frequently expelled the catheter and forced urine through the stitches."

My assistant, Dr. Powell, conducted the after-care of the case most admirably; and upon my return after an absence of three weeks I found the fistula perfectly healed excepting a small valvular opening at the crossing of the vertical and horizontal suture lines. This little opening was readily closed by freshening its edges and drawing them together with a few shotted silver wire sutures, the irrigating catheter being again introduced for ten days during the healing process. At the end of this time the vesico-vaginal septum was perfect and the patient could retain her urine for half an hour.

Twelve years of disuse of the bladder had, however, so altered the conditions that of necessity a long time must elapse before sufficient expansion and tolerance can make its capacity what it should be, and much re-development of the unused sphincter will be required for the retention of the urine. This process is going

duced were intolerable. This was done, after which the vagina and bladder were irrigated twice a day with mild antiseptic solutions, and urotropin was freely administered by mouth. The relief from pain and disappearance of the putrid ammoniacal odor were immediate, and marked improvement in the local conditions quickly followed.

Then it occurred to me that perhaps a successful closure of the fistula might be made if perfect drainage of the bladder could be secured along with a continuance of the frequent irrigations, which had already accomplished so much for her in the way of improvement. Concluding that this could be done with my double tubes, the attempt was made.



1. Cut two holes in a long piece of drainage tubing as indicated at A and B. 2. Draw one end of the tube through A and out at B, thus inverting that portion of the tube between the holes as seen in 2. 3. Bend the legs of the tube down so that the holes A and B will be left open for drainage. If bent in one direction they are open, if in the other closed. Tack with a blind stitch at C. Use soap or pulverized soapstone to make the tubes slip.

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on quite satisfactorily, however, as the patient now retains her urine for about two hours, and passes from two to three ounces at a time. The scar is soft and firm and the septum perfect, though the vagina is very shallow and the bladder small from the removal of so much tissue at the numerous operations.

In this case the self-retaining catheter worked like a charm; the facility it offered for frequent irrigations of the bladder without disturbing the position of the patient in bed, indeed without thoroughly awaking her from a sound sleep at times, made success possible.

In those intractable cases of chronic cystitis in women, when an old infection has made the formation of a temporary vesico-vaginal fistula necessary for drainage, I believe this self-retaining catheter and vesical irrigator will accomplish the same good end without the creation of the fistula.

The use of urotropin is a most valuable adjunct in the treatment of all of these cases.

I have had no opportunity to make a trial of this device in the male urethra; but if there be no tight stricture or great enlargement of the prostate gland I believe it can be so used. It can easily be adapted to all cases in which a perineal cystotomy has been done, as in the various prostatic operations, and also in external urethrotomy.

Since writing the above I have operated upon another vesico-vaginal fistula, also the result of a vaginal hysterectomy. Though two successful attempts at its closure had been made I had the good fortune to secure perfect union and a tight septum, at my first attempt. Again the self-retaining catheter and irrigating device was used with great comfort to the patient and entire satisfaction to the operator. In this case also I have felt that the certainty of the good result attained was due more to this simple device than to any unusual skill in performing the operation.

COMPOUND TRAUMATIC SEPARATION OF THE LOWER EPIPHYSIS OF THE FEMUR WITH REPORT OF TWO CASES.

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The gravity of this injury may be inferred from a summary of the fifty cases collected by Mr. Poland (Traumatic Separation of the Epiphyses, London, 1898, page 793). Of these, 33 underwent amputation, with 18 recoveries, 8 deaths and result not stated in 7. The remaining seventeen were treated conservatively, with thirteen recoveris and four deaths.

The fact that about one-half of the number occurred in the pre-antiseptic period suggests the conclusion that a better showing might have been made had all been treated by modern methods. This is undoubtedly correct as to the saving of limb, but as to the saving of life the case-records show that the mortality rate has been as heavy since 1885 as before.

The danger to life in these cases accrues from shock, gangrene and infection. The first, as would be expected in accidents of such magnitude, is generally present in some degree of severity and is credited with causing six of the deaths in Mr. Poland's series (only three of these, however, directly due to the accident, the other three following amputation). Gangrene occurs in the cases wherein the popliteal vessels are injured—which occurs in about 25 per cent. of the cases—unless obviated by early amputation. Infec-

tion, as in all other open, accidental wounds, must be reckoned with, and upon the surgeon's ability to control it depends everything.

The object of this paper is not to make an exhaustive analysis of the subject. This has been done elsewhere and those who wish to look into it further will find an adequate consideration of the matter in Mr. Poland's work, while for a compact résumé brought down to the present date, I commend your attention to the report of M. Kirmisson of Paris, presented at the French Congress of Surgery in October, for a copy of which I am indebted to the courtesy of the author.

The two cases which it has been my fortune to observe occurred five and a half years and six weeks

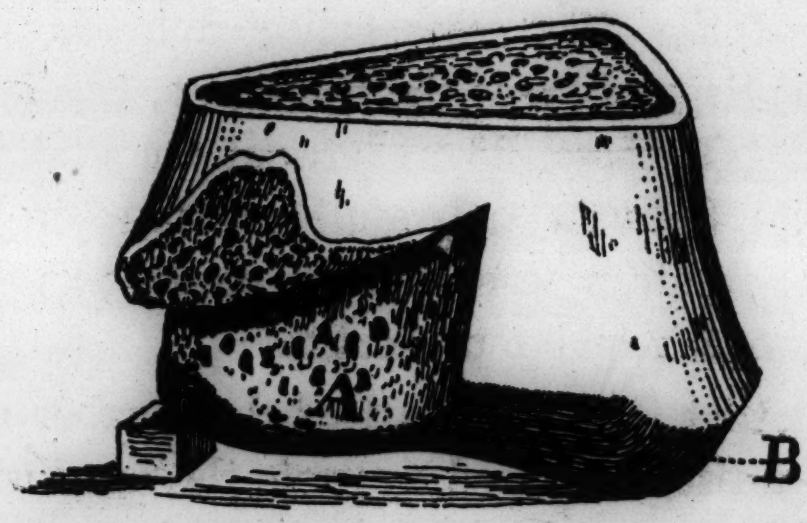


Fig. 1.—Anterior view of the piece of shaft of the femur resected, showing at A the defect caused by the disruption of the wedge-shaped fragments of bone which remained attached to the epiphysis. At B is the epiphyseal line.

ago, respectively. In the former case, therefore, sufficient time has elapsed to enable me to report the effect of the injury upon the growth of the femur. The early history of the case was reported fully by me to the Iowa State Association of Railway Surgeons and published in the *Railway Surgeon* of Dec. 26, 1899. I need, therefore, repeat only salient features.

CASE 1.—Wesley G., aged six years and none months, was riding with some other children in a buggy on July 30, 1899, letting his left leg hang outside and the foot rattle against the spokes of the wheel. An entanglement resulted and he was dragged out of the

buggy and thrown to the ground. The other children picked him up and took him home, a distance of one and a half miles, where I saw him in consultation with the family physician. An examination showed the protrusion of about five centimeters of the diaphysis of the femur through a transverse wound in the left biceps femoris and skin, at the outer margin of the popliteal space. It was denuded of periosteum and showed the characteristic nodulated end. The epiphyseal line had not been closely followed, a wedge-shaped

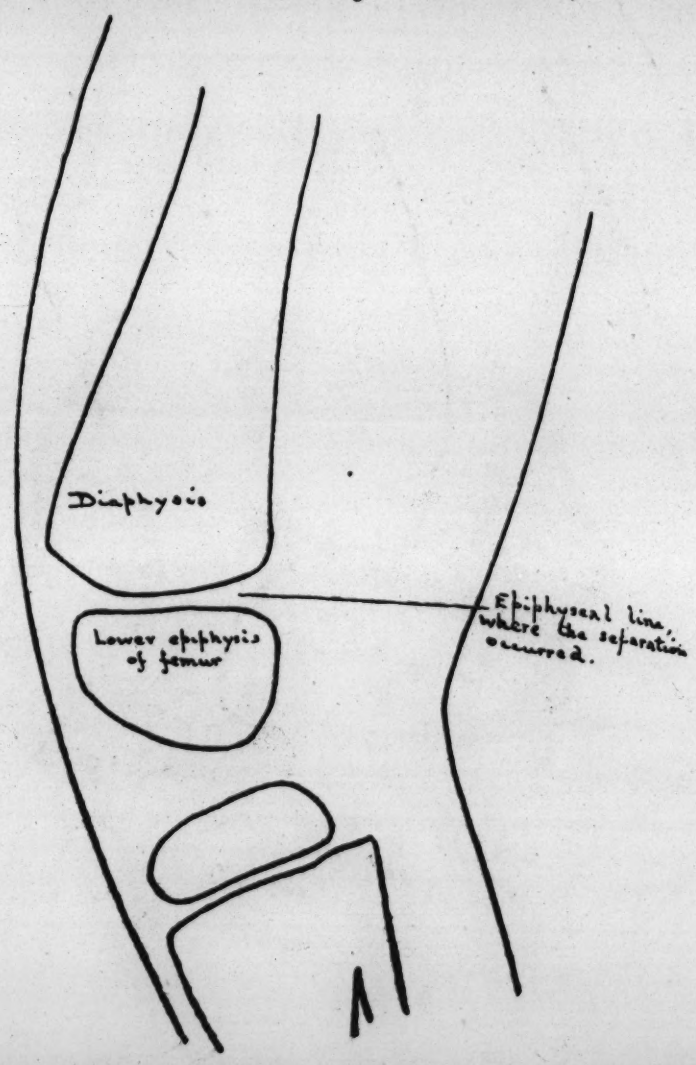


Fig. 2.—Skiagraphic tracing (lateral view) of Case 1; taken at the end of the tenth week after the receipt of the injury.

fragment from the anterior and inner aspect of the diaphysis having been detached with the epiphysis. The popliteal vessels were intact and the peroneal nerve had escaped injury. The epiphysis was tilted backward.

Under anesthesia I enlarged the opening by making a longitudinal incision through the center of the wound and succeeded in replacig the shaft, but so great was the contraction of the thigh muscles that the least movement caused the fragments to fly apart with great

violence. I therefore resected three centimeters of the diaphysis (Fig. 1) and could then effect reduction easily, although it was necessary to drill and wire in order to secure continued apposition of the fragments. The large external wound was left open and the entire extremity in full extension put up in plaster-of-Paris.

The primary result was very satisfactory. Granulation proceeded rapidly and in six weeks the wound in

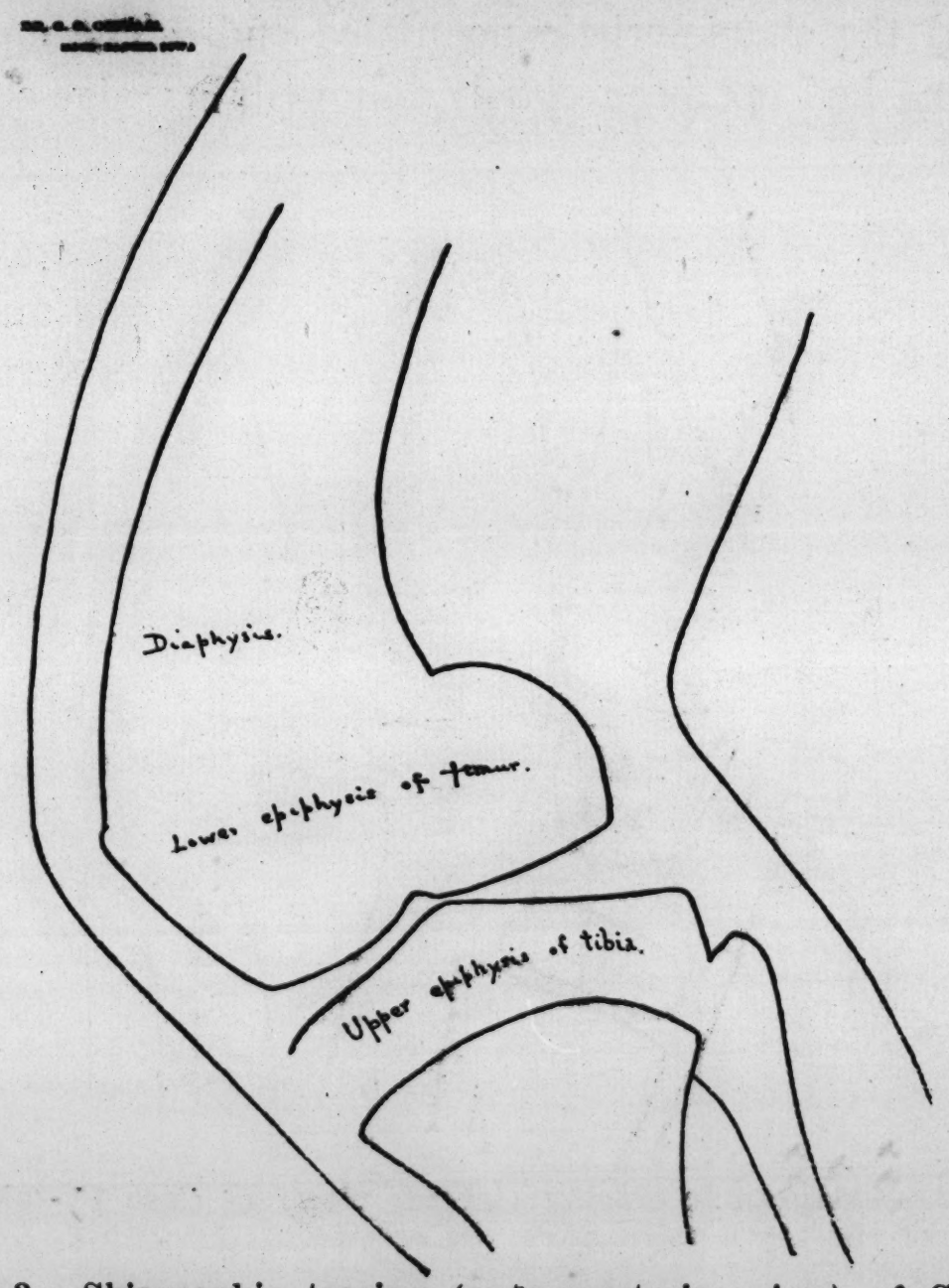


Fig. 3.—Skiagraphic tracing (anteroposterior view) of Case 1; taken five and a half years after the receipt of the injury, showing "bowing" of the femur due to irregular development of the shaft, with resultant genu valgum.

the soft parts was entirely closed. The cast was discontinued at the end of the ninth week and an *x*-ray examination shortly afterward showed the fragments to be in correct apposition. At the nineteenth week the joint function was found to be fully restored, and the boy could walk and run without perceptible limp, unaided by stick or crutches.

The subsequent history of this case shows the development of a curious and interesting condition. As the boy's growth proceeded it was noticed that the knee on the injured side was becoming more and more "knocked." When my attention was first called to this I formed the opinion, which was strengthened by careful examination, that the deformity was due to arrest of growth of the outer condyle, the inner continuing to develop. This I associated with the fact that the

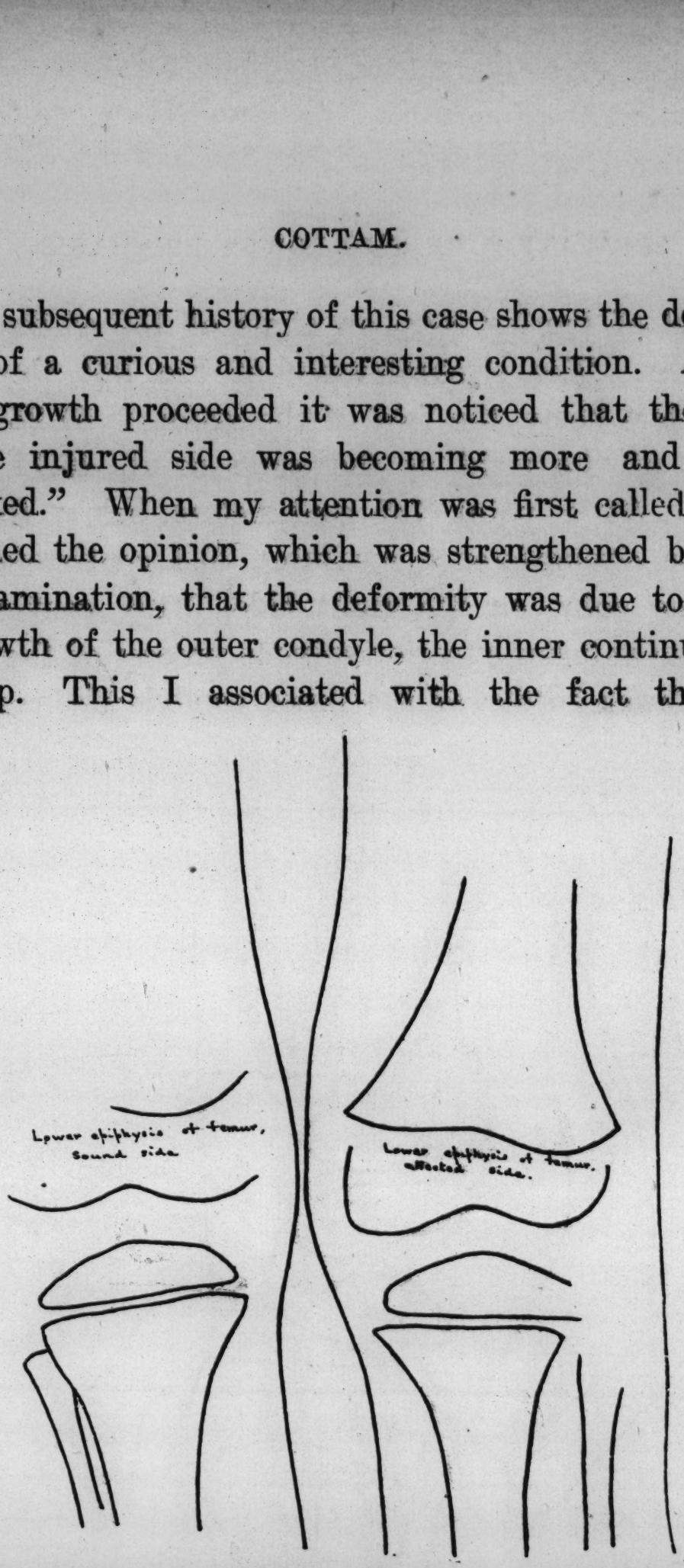


Fig. 4.—Skiagraphic tracing of both knees (anteroposterior view) of Case 2; taken six weeks after the injury.

epiphyseal cartilage on the inner and anterior aspect was undisturbed by the injury and the growth at that point had therefore been uninterfered with. But, on making a skiagraphic examination recently, I found the entire fault to be with the shaft, the inner part of which seems to be trying to develop normally, while the growth of the outer part is arrested, producing a condition of "bowing," with the concavity outward, as shown in Figure 3. The long axis of the thigh

and that of the leg form an angle of 130 at the knee, externally. The circumference of the left thigh, 18 centimeters below the fold of the groin, is 41.25 centimeters; of the right at the same point, 45.75 centimeters. At a point 7.5 centimeters below the left knee the circumference measures 30.4 centimeters; at the same point on the right side, 31.6 centimeters. From the anterior superior spinous process of the ilium to the lower border of the inner condyle the measure-

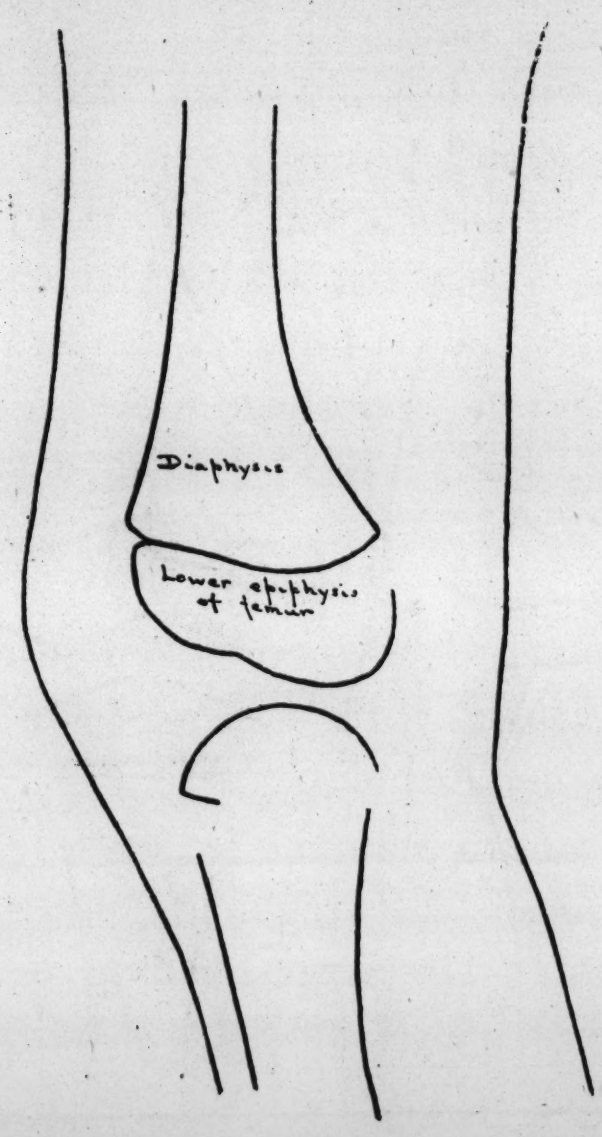


Fig. 5.—Skiagraphic tracing (lateral view) of the injured side in Case 2; taken at the same time as Fig. 4.

ments are: right, 42.8 centimeters; left the same. From the same pelvic point to the lower margin of the outer condyle the measurements are, right, 40.4 centimeters; left, 34.2 centimeters. Thus, while the inner side of the femur on the injured extremity has kept pace with its fellow or even done a little better, since 3 centimeters were removed at the operation, the outer side shows a discrepancy of 6.2 centimeters.

It is evident that the deformity could be properly remedied by an osteotomy, and if the parents of the boy can ever be brought to understand that this will not mean a repetition of the original injury, with its shock and infection, it will be done.

CASE 2.—Theodore S., aged five years and nine months, was trying to climb into a buggy in motion on Nov. 9, 1904, when his left foot became entangled in the spokes of one of the wheels and he was thrown violently to the ground. I saw him the same night in consultation with his physician, near Steen, Minn., and found an almost precisely similar condition to that described in the preceding case. The diaphysis had penetrated the biceps femoris just above the knee and protruded about 4.5 centimeters through the skin, and was stripped of its periosteum. As in the other case the popliteal vessels and peroneal nerve were uninjured and a piece of bone broken off in the anterior surface of the lower end of the shaft. In this case I found this detached portion broken into several parts and removed them with a sequestrum forceps. The epiphysis was not displaced.

Under chloroform reduction was readily accomplished, and, once reduced, the fragments showed no tendency to displacement. The large opening in the soft parts was packed with gauze and the extremity put up on a double inclined plane. At the end of the fifth week the knee was put up straight in plaster-of-Paris and at the present time, seven weeks after the receipt of the injury, the wound in the soft parts is nearly well and union appears to be proceeding normally. Figures 4 and 5 show the skiagraphic record of the case at this time.

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